OLYMPIA

# Service manual

## Carrera de Luxe MD

Service Department

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# Introduction

This service manual contains all the information necessary for the knowledge and servicing of the model

**Carrera de Luxe MD**

and has been compiled primarily for the trained service technician as an aid when carrying out repairs.
This publication has been drawn up in such a manner that once the spine has been removed, it can be inserted in a file. For this purpose, a page containing labels is included, in which case the labels can be cut out and pasted on to permit a register to be made up in the manner required by the user. In this connection, the appropriate A5 files is also obtainable from Olympia.
A sheet for the incorporation of amendments and improvements is attached. Your comments will assist us when compiling further issues and supplements.
The right to amend this publication is reserved at all times. It is not proposed to exchange amended sheets on an automatic basis.

Olympia Office Vertriebsgesellschaft mbH
Central Service Department

## Etiketten für Service-Sammelordner
Stickers for Service documentation file
Etiquette pour classeurs Service Après-Vente
Etiquetas para clasificadores de documentación técnica

**Mit Hilfe der auf diesem Blatt befindlichen Etiketten können Sammelordner so eingerichtet werden, wie es Ihren Vorstellungen entspricht.**

The provision of the stickers on this sheet permits the file to made up in the manner required by the user.

En se servant des étiquettes se trouvant sur cette feuille il sera possible de subdiviser vos classeurs selon vos idées.

Mediante las etiquetas autoadhesivas de esta hoja se pueden organizar e identificar los clasificadores en la forma que más convenga.

**Die Bestellnummern für passende Ordner und Register sind:**

The reference numbers for appropriate A4 files and a special register are:

A noter les numéros de commande à indiquer lors de la commande des classeurs et registres correspondants:

Se pueden pedir los clasificadores y los registros bajo las siguientes referencias:

**05.9990-099.0/00** **Ordner,** File, Classeur, Clasificador
**05.9991-099.0/00** **Register mit Deckblatt,** Register with cover, Registre avec page de couverture, Registro con cubierta
**05.9991-199.0/00** **Austauschdeckblatt für Register,** Register exchange cover, Page de couverture de rechange pour registre, Cubierta de recambio para el registro

**Etiketten für Register-Deckblatt**
Stickers for register cover
Etiquette collante pour page de couverture registre
Etiquetas pra la cubierta del registro

| | | |
|---|---|---|
| **Carrera de Luxe MD** | **Service manual** | Ident.-Nr.: 7621.00.12 |
| | **Service manual** | Ident.-Nr.: 7621.00.12 |


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**Etiketten für Ordner-Rücken**
Stickers for the spine of the file
Etiquette collante pour verso classeur
Etiquetas para el lomo del clasificador

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| **Carrera de Luxe MD** | |


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# Table of Contents


**1. Specifications . . . . . 1-1**
1.1 General Specifications . . . . . 1-1
1.2 Hardware Specifications . . . . . 1-2

**2. General Construction . . . . . 2-1**
2.1 Basic Assemblies . . . . . 2-1
2.2 Electronic Assemblies . . . . . 2-2

**3. Description of Functions . . . . . 3-1**
3.1 Power Supply . . . . . 3-1
3.2 CPU, Gate Array and Control PCB . . . . . 3-3
3.3 Reset/Delay Circuit . . . . . 3-8
3.4 Memory Backup . . . . . 3-10
3.5 Left End Switch . . . . . 3-11
3.6 Beeper Circuit . . . . . 3-11
3.7 LCD . . . . . 3-12
3.8 Spelling Check (if applicable) . . . . . 3-14
3.9 Initial Operations (Initialization) . . . . . 3-15
3.10 Keyboard and Key Scan . . . . . 3-18
3.11 Motors, Solenoid, and Drive Circuits . . . . . 3-20
3.12 Printing Impression . . . . . 3-26
3.13 +VH Level Detection . . . . . 3-26
3.14 Printing Cycle . . . . . 3-27
3.15 Mechanisms . . . . . 3-30

**4. Adjustment and Measurements . . . . . 4-1**
4.1 General Adjustment Procedure . . . . . 4-1
4.2 Self Printing Test . . . . . 4-1
4.3 Setting Adjustment Mode . . . . . 4-2
4.3.1 Carrier Home Position Adjustment Mode . . . . . 4-2
4.3.2 Selection Motor Home Position and Hammer Position Adjustment Mode . . . . 4-2
4.3.3 Carrier and Platen Position Adjustment Mode . . . . . 4-2
4.4 Adjustment Procedure . . . . . 4-3
4.4.1 Carrier Home Position Adjustment . . . . . 4-3
4.4.2 Selection Motor Home Position Adjustment . . . . . 4-5
4.4.3 Hammer Position Adjustment . . . . . 4-7
4.4.4 Carrier and Platen Position Adjustment . . . . . 4-8
4.4.5 Correction Tape Lift and Ribbon Tape Position Adjustment . . . . . 4-10
4.4.6 Carrier Drive Tension . . . . . 4-12
4.4.7 Line Locator Adjustment . . . . . 4-13

**5. Disassembly and Reassembly . . . . . 5-1**
5.1 Housing . . . . . 5-1
5.2 Keyboard and Control PCB . . . . . 5-3
5.3 Chassis Frame and Platen . . . . . 5-7
5.4 LF (Line Feed) Motor and Carrier Drive . . . . . 5-9
5.5 Cassette Base and Ribbon Drive . . . . . 5-12
5.6 Selection and Hammer . . . . . 5-15
5.7 Power Supply . . . . . 5-18
5.8 Wire Routing . . . . . 5-20

**6. Lubrication and Cleaning . . . . . 6-1**
6.1 Lubrication . . . . . 6-1
6.2 Cleaning . . . . . 6-4

**7. Tools . . . . . 7-1**

**8. Troubleshooting . . . . . 8-1**

**9. Circuit Diagrams and Layouts . . . . . 9-1**
9.1 Power Supply . . . . . 9-1
9.2 Keyboard . . . . . 9-3
9.3 Motor Diagrams . . . . . 9-5
9.4 Solenoid and Switch Diagrams . . . . . 9-6
9.5 LCD . . . . . 9-7
9.6 Control PCB . . . . . 9-8

# 1. Specifications

## 1.1 General Specifications

| | |
|---|---|
| **Print mode** | |
| Printing mechanism: | Printwheel (no rubber); all characters |
| Number of characters: | 100 characters |
| Line spacing: | Single-line spacing (6 LPI (lines per inch))<br>1-1/2-line spacing (4 LPI)<br>Double-line spacing (3 LPI) |
| Print pitch: | Pica:90 characters per line<br>Elite:108 characters per line<br>Micro:135 characters per line |
| Printing width: | 9.0" (229.0mm) |
| Paper width: | 13.0" (330.0mm) |
| Printing speed: | 11 CPS (characters per second) |
| Key buffer: | 30 characters (maximum) |
| Number of copies: | 1 original + 2 copies |
| Printing impression control: | Low/medium/high, or adjustable (by engineer) using a short jumper (SW202) on the control PCB |
| Preset margins (factory settings): | Pica:Left - 10, right - 75<br>Elite:Left - 12, right - 90<br>Micro:Left - 15, right - 113 |
| Tab settings: | 16 tabs (can be set/released without selecting a position) |
| Correction memory: | Full-line |
| Ribbon cassette: | |
| Correctable ribbon cassette (standard): | Approximately 50,000 characters/cassette;<br>0.31" (8.0mm) × approximately 191.4 yds (175.0m) |
| Fabric ribbon cassette (optional): | Approximately 150,000 characters/cassette;<br>0.31" (8.0mm) × approximately 13.1 yds (12.0m) |
| Multi-strike ribbon cassette (optional): | Approximately 400,000 characters/cassette;<br>0.31" (8.0mm) × approximately 131.2 yds (120.0m) |
| Correction tape: | |
| Lift-off correction tape (standard): | Approximately 1,700 characters |
| Cover-up correction tape (optional): | Approximately 1,400 characters |

## 1.2 Hardware Specifications

**Power supply**

| | |
|---|---|
| Primary circuit voltage: | 100V AC ±10% 50/60Hz<br>120V AC ±10% 50/60Hz<br>230V AC ±10% 50/60Hz |
| Secondary circuit voltage: | +15V DC (+VH) unstable voltage (with DC 1.5A load)<br>+5V DC (+VC) stable voltage |
| Power consumption: | Under rated load: Approximately 4W (standby)<br>Approximately 18W (operation)<br>Under no load: 2W (power off) |

**Fuses**

| | |
|---|---|
| Secondary circuit: | 3.0A 250V (100/120/230V, AC 50/60Hz) |
| Built into transformer: | thermal fuse (+266°F (+130°C 12A)) |

**Stepping motors**

| | |
|---|---|
| Carrier motor: | |
| Step angle: | 15° (24 steps/rotation (1/2 step/character)) |
| Resistance per coil: | 27Ω/coil |
| Drive voltage: | +VH |
| Selection motor: | |
| Step angle: | 15° (24 steps/rotation (2 steps/character)) |
| Resistance per coil: | 42Ω/coil |
| Drive voltage: | +VH |
| LF (line feed) motor: | |
| Step angle: | 15° (24 steps/rotation) |
| Resistance per coil: | 45Ω/coil |
| Drive voltage: | +VH |
| Ribbon motor: | |
| Step angle: | 15 (24 steps/rotation) |
| Resistance per coil: | 42Ω/coil |
| Drive voltage: | +VH |

**Keyboard**

| | |
|---|---|
| Keyboard style: | Rubber contact switches (8 × 8 keyboard matrix) |
| Number of printing keys: | 45 keys |
| Number of function keys: | 17 keys |
| Key rollover system: | 2-key rollover |
| Repeat function: | Time delay method |

**Display**

| | |
|---|---|
| Type: | LCD (liquid crystal display) |
| Number of display characters: | 20 characters × 2 lines (100 columns × 16 rows) |
| Drive duty: | 1/16 duty |
| Character configuration: | 5 columns × 8 rows (including the cursor) |

**Electronic assembly**

| | |
|---|---|
| CPU: | Toshiba TMP90C141N (CMOS) 8-bit microprocessor |
| ROM (IC203): | 512K bit or 1M bit EP ROM from SGS, Sony, National Semiconductor, etc.<br>ROM capacity depending on whether the unit is equipped with the spelling checker function or not and on differences in the number of arrays.<br>A 4M bit mask ROM can also be used (contains the spelling check program and dictionary). |
| ROM (IC204): | 2M bit mask ROM (contains the spelling check dictionary). |
| Gate array: | The NEC μPD65006CW-A19 or μPD65006CW-A22 is a semi-custom CMOS gate array in which each gate has been designed for this typewriter. |
| RAM: | 256K bit or 1M bit CMOS static RAM (manufactured by NEC and others), or equivalent. |

**Battery**

| | |
|---|---|
| Type: | Model CR2032 lithium ($Li/MnO^2$) battery with tab (manufactured by Matsushita, Sanyo, Sony, etc.), or equivalent. |
| Voltage: | +3.0V (210mAh) |
| Size: | 0.85" (21.5mm) diameter × 0.15" (3.8mm) |
| Applications: | Store memory backup |
| Operational life: | Five years at operating temperature |

**Environmental conditions**

| | |
|---|---|
| Operating temperature: | +41°F to +95°F (+5°C to +35°C) |
| Storage temperature: | -13°F to +140°F (-25°C to +60°C) |
| Relative humidity: | 90% (+140°F (+60°C)) |

**Dimensions**

| | |
|---|---|
| Width: | 16.8" (426mm) |
| Height: | 4.6" (117mm) |
| Depth: | 14.8" (375mm) |
| Weight: | 11.6 lbs (5.2 kg), including the keyboard cover |

Note: The nominal specs represent the design specs. All units should approximate these specs - some will exceed and some may drop slightly below these specs. Limit specs represent the absolute worst condition that still might be considered acceptable. In no case shall a unit fail to meet limit specs.

# 2. General Construction

## 2.1 Basic Assemblies

This typewriter consists of the following five major assemblies.

1) Chassis frame and platen
This assembly consists of the carrier motor, the LF (line feed) motor, the carrier drive mechanism, and the platen.

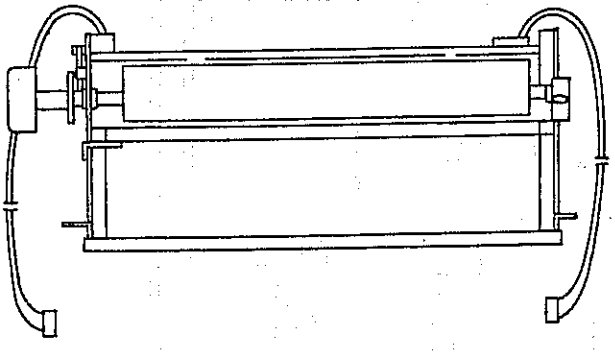
2) Input circuit and control PCB
This assembly consists of the transformer, input circuit, and the control PCB (printed circuit board).

3) Carrier
This assembly consists of the ribbon feeder, lift mechanism (correction feeder), ribbon motor, hammer solenoid (printing mechanism), selection mechanism, and left end switch.

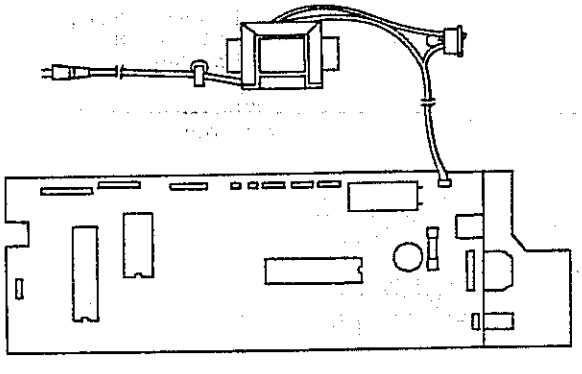
4) Keyboard
This assembly consists of the keyboard panel, membrane sheet, keyboard support panel, and keytops.

5) Housing
This assembly consists of the main cabinet, top cover, paper support, cord cover, bottom cabinet, keyboard cover, and LCD.

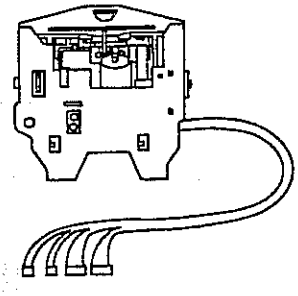
1) CHASSIS FRAME AND PLATEN



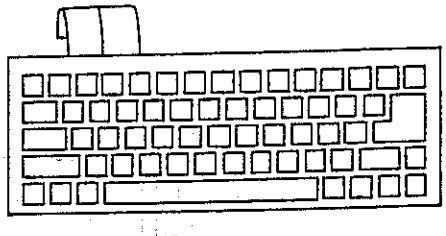
2) INPUT CIRCUIT AND CONTROL PCB



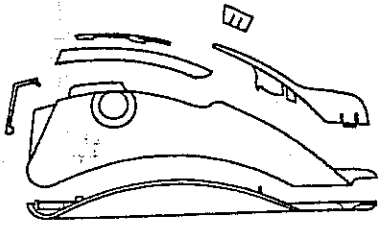
3) CARRIER



4) KEYBOARD



5) HOUSING



## 2.2 Electronic Assemblies

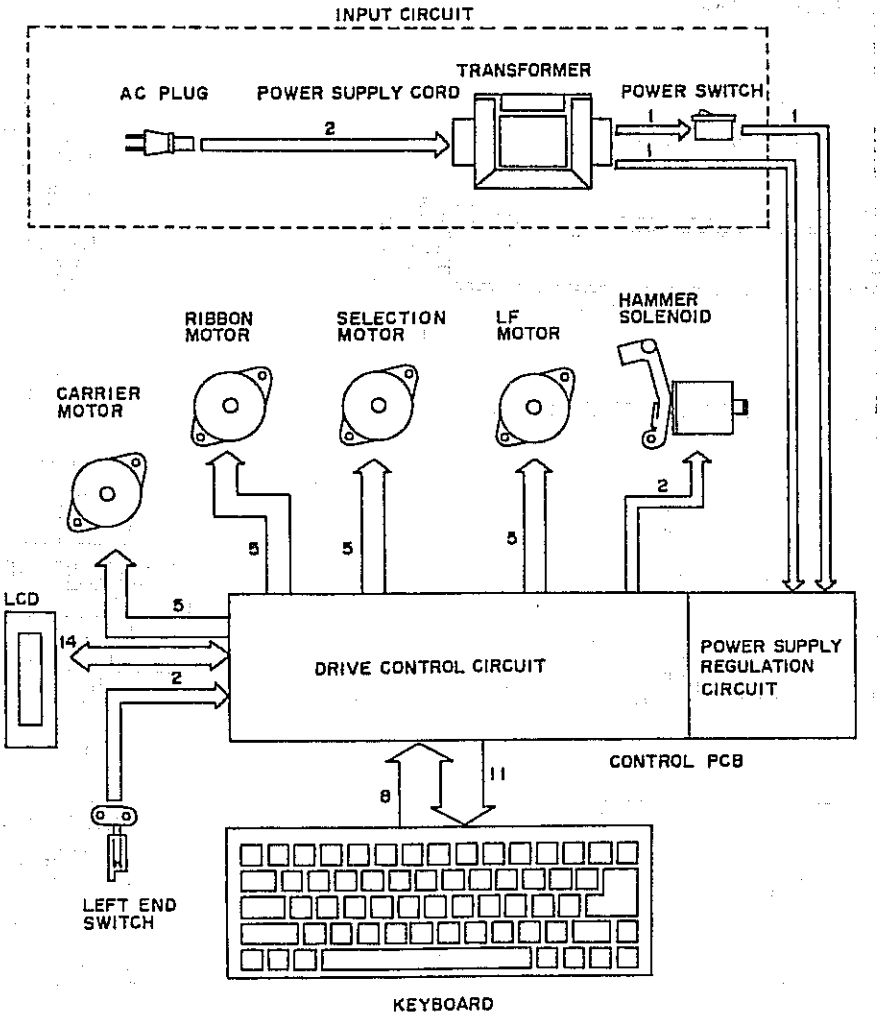
The basic configurations of the electronic assemblies are described below:

1) Input circuit
This assembly supplies voltage through the power cord, transformer, and power switch.

2) Control PCB (power supply smoothing circuit and drive circuit)
In the power supply smoothing circuit AC voltage is transformed into DC voltage. In the drive circuit, the ICs (such as the CPU and gate arrays) and transistors drive and control the stepping motors, hammer solenoid, etc.
The store data is stored in RAM.
The LCD displays text and information on functions.

3) Keyboard
The keyboard assembly consists of the keyboard panel, membrane sheet (8 x 8 key matrix), keyboard support panel, and keytops.

4) Actuator and left end switch
The carrier, platen, selection, and ribbon/correction tape mechanisms are driven by four stepping motors, while the hammer solenoid (printing mechanism) moves the hammer.
The left end switch detects the carrier home position and reports it to the CPU.

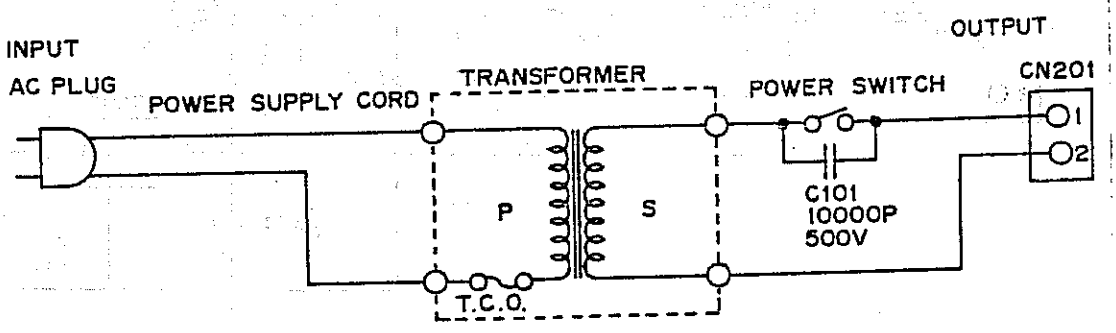


# 3. Description of Functions

## 3.1 Power Supply

The power supply consists of the input circuit (transformer, power cord, power switch). The AC voltage from the power supply is converted to DC voltage, smoothed, and then supplied to the control circuit.

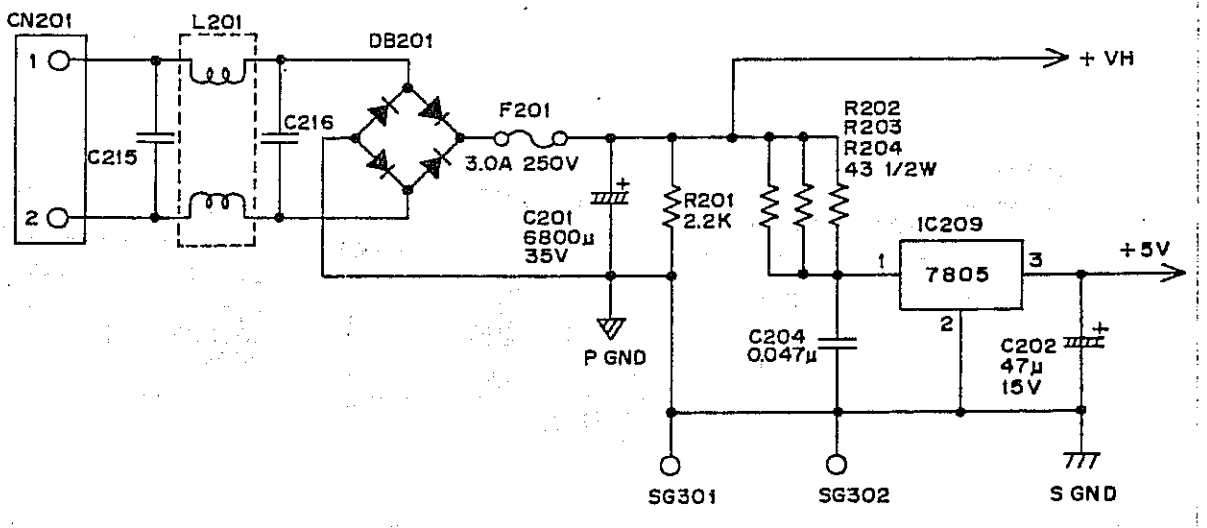
1) Input circuit
This circuit consists of the power cord, transformer, and power switch.
The voltage output to the circuit is determined by the turns ratio of the coils on the primary (P) side and the secondary (S) side of the transformer.
Although the transformer that is used depends on the specifications for the input voltage (100/120/230V, 50/60Hz), the only difference is the number of turns in the primary coil.
When the primary (P) side input voltage is the rated voltage, the secondary side output voltage is 15V AC ±10% (when there is no load). The primary side coil is equipped with one thermal fuse (T.C.O.). If the temperature of the transformer reaches 266°F (130°C), the thermal fuse blows in order to prevent damage to the secondary circuits.



2) Regulation circuit
The bridge rectifier (DB201) and capacitor (C201) rectify and smooth out the alternating current voltage lowered by the transformer and convert it to unstable direct current +VH voltage. The regulator IC (IC209) converts the voltage to a stable +5V.

+VH line:unstable voltage
The AC voltage between pins 1 and 2 of the connector (CN201) is rectified and smoothed by the bridge rectifier (DB201) and the capacitor (C201) and is converted to direct current +VH voltage. The 3.0A, 250V fuse (F201) protects the secondary circuits from overcurrent; current of 3.0A or greater causes the fuse to blow, interrupting the circuit.

+5V (VC) line:stable voltage
IC209 is a three-pin regulator IC that outputs +5.0V if the input voltage is +7V or more. When the rectified and smoothed +VH voltage is input to the IC209 input pin (pin 1), stable +5.0V voltage is output from the output pin (pin 3).



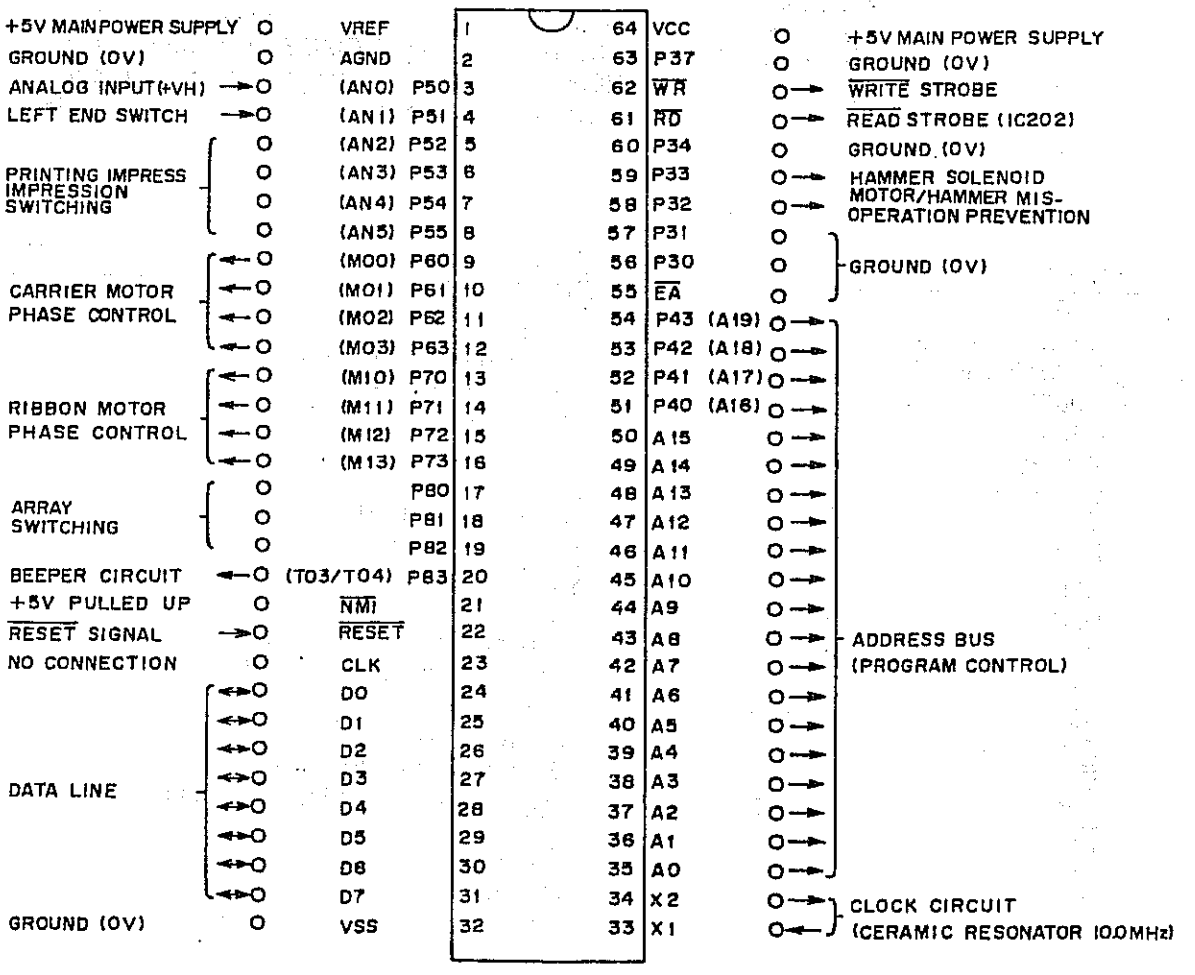
## 3.2 CPU, Gate Array and Control PCB

1) IC201:CPU (central processing unit)
The TMP90C141N, produced by Toshiba, is a 64-pin, 8-bit CMOS microprocessor in a shrink DIP package that has on chip 1K byte of RAM, a stepping motor control circuit, an A/D converter, 28 I/O pins, and a clock circuit (which operates with an external 10.0MHz ceramic oscillation circuit).

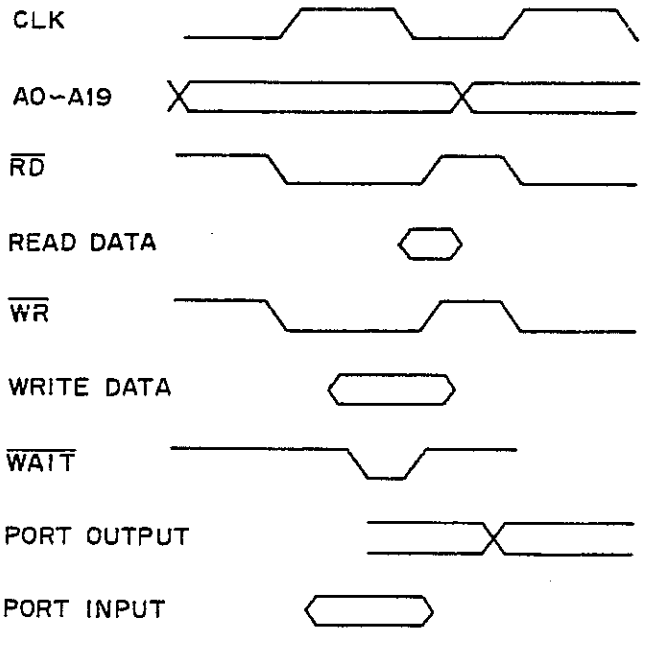
Pin description of CPU (IC201)

| Symbol | Pin No. | Function |
|---|---|---|
| VREF | 1 | Input voltage |
| AGND | 2 | Ground (0V) |
| AN0/P50-AN5/P55 | 3-8 | Port input & analog input |
| M00/P60-M03/P63 | 9-12 | Port stepping motor control |
| M10/P70-M13/P73 | 13-16 | Port stepping motor control |
| P80-P82 | 17-19 | Analog input |
| TO3/TO4 (P83) | 20 | Port output |
| $\overline{\text{NMI}}$ | 21 | Port non-maskable interrupt request |
| $\overline{\text{RESET}}$ | 22 | Reset (initializes CPU) |
| CLK | 23 | Output clock (no connection) |
| D0-D7 | 24-31 | Data bus |
| VSS | 32 | Ground (0V) |
| X1,X2 | 33,34 | Port input/output for ceramic resonator |
| A0-A15 | 35-50 | Address bus |
| P40/A16-P43/A19 | 51-54 | Address bus |
| $\overline{\text{EA}}$ | 55 | External access (ground) |
| P30-P34 | 56-60 | Port output, analog input & ground |
| $\overline{\text{RD}}$ | 61 | Read strobe |
| $\overline{\text{WR}}$ | 62 | Write strobe |
| P37 | 63 | Ground |
| VCC | 64 | Input voltage |

Pin configuration of CPU (IC201)




Timing chart for CPU (IC201)



2) IC202:Gate array

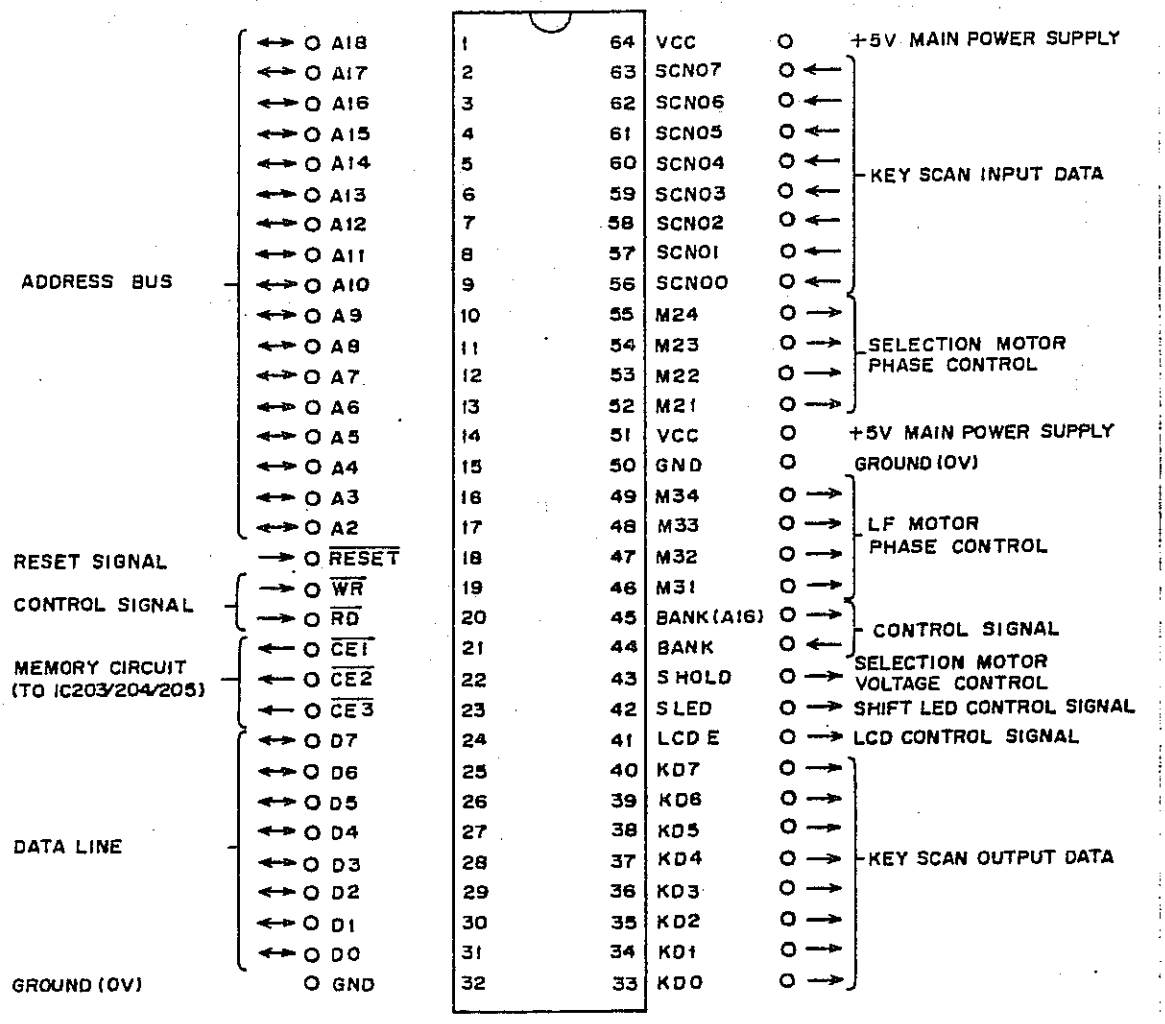
The μPD65006CW (manufactured by NEC) is a 64-pin CMOS-4A gate array packaged in a shrink DIP, and contains 504 gates and multi-function I/O circuits. IC202 is a semi-custom gate array in which the gates have been arranged to permit control of the stepping motor, keyboard, and LCD.

This gate array comes in two versions: the μPD65006CW-A19, which is used normally, and the μPD65006CW-A22, which is used when using the spelling check function.

Pin description of gate array (IC202)

| Symbol | Pin No. | Function |
|---|---|---|
| A18-A2 | 1-17 | Address bus |
| RESET | 18 | Reset (initializes gate array) |
| WR | 19 | Write strobe |
| RD | 20 | Read strobe |
| CE1-CE3 | 21-23 | Chip enable (to IC203/204/205) |
| D7-D0 | 24-31 | Data bus |
| GND | 32,50 | Ground (0V) |
| KD0-KD7 | 33-40 | Data bus (key scan input) |
| LCDE | 41 | LCD enable |
| SLED | 42 | Port output |
| SHOLD | 43 | Port output |
| BANK (A16) | 44,45 | Bank select |
| M31-M34 | 46-49 | Port stepping motor control |
| VCC | 51,64 | Voltage input |
| M21-M24 | 52-55 | Port stepping motor control |
| SNO0-SNO7 | 56-63 | Data bus (key scan output) |

Pin configuration of gate array (IC202)

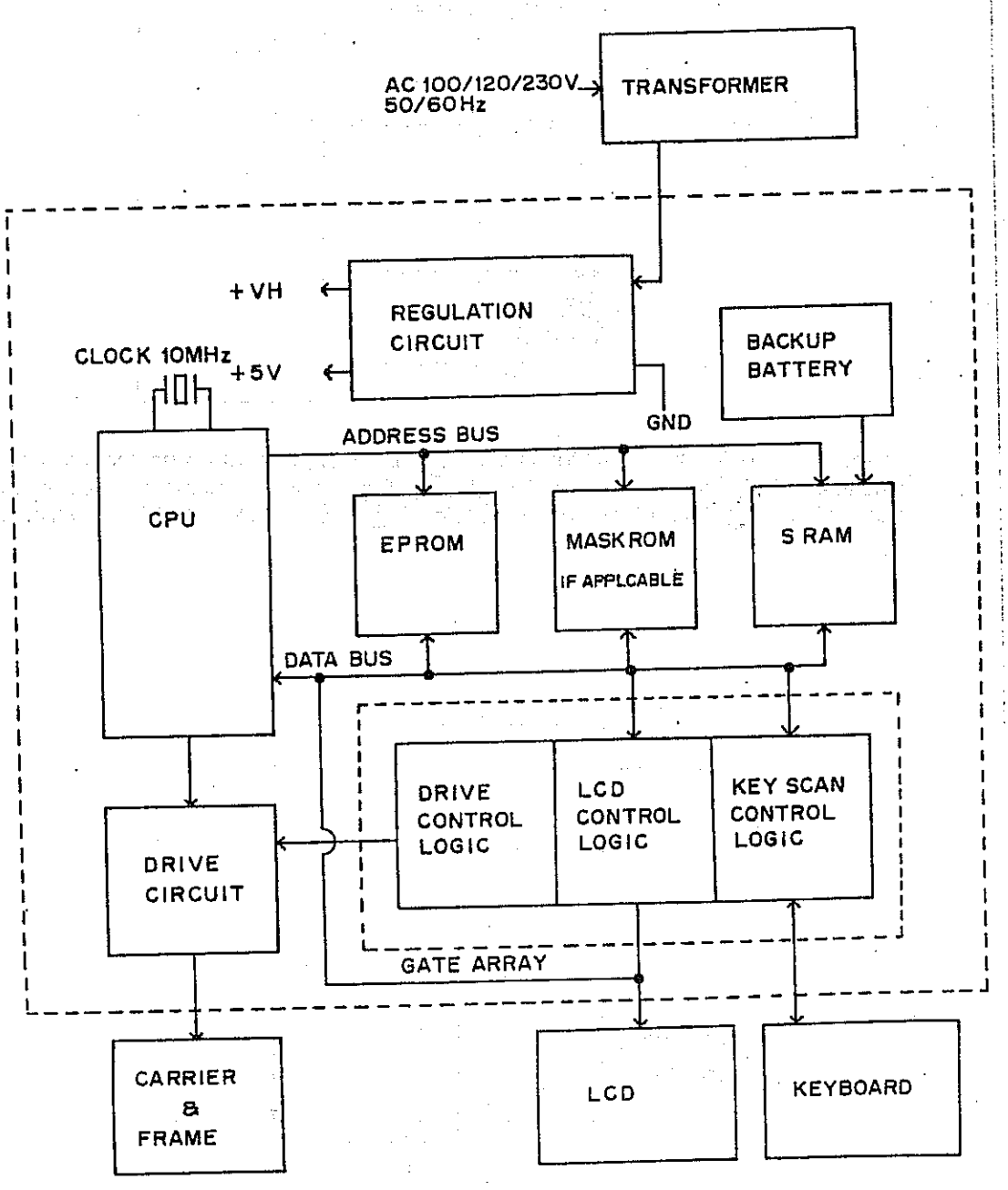


3) Components and general operation

The control PCB includes a CPU (IC201), a gate array (IC202), a 512K/1M bit (depending on whether the unit is equipped with the spelling checker function or not and on differences in the number of arrays) EP ROM (IC203) programmed with the data necessary for the operation of the typewriter, RAM (IC205) that holds the store data, and their peripheral devices. If the unit is equipped with the spelling checker function, the control PCB is also equipped with a mask ROM (IC204).

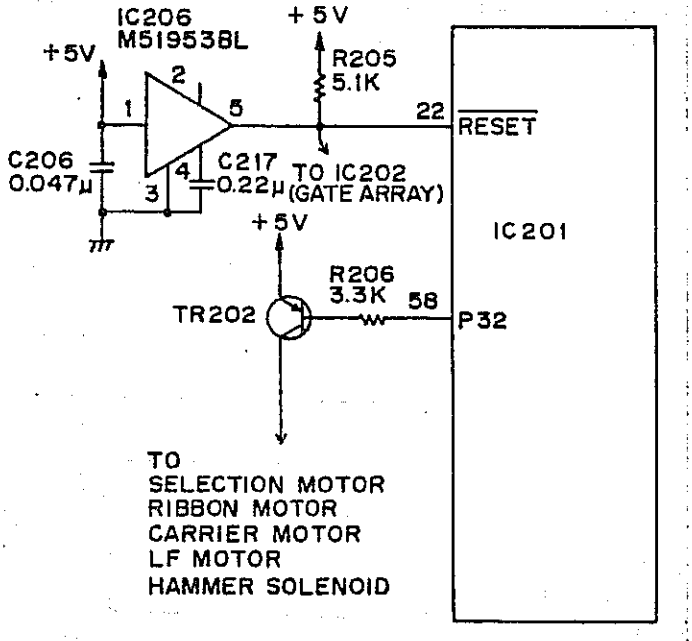
When the power is turned on and the initial operations are completed, the CPU (IC201) begins key scanning the keyboard through the gate array (IC202). If key input is deemed to have been made, the CPU (IC201) reads the data concerning the printing impression for that key, the step angle for the motor, etc., from ROM (IC203). The excitation phasing of the selection motor, carrier motor, ribbon motor and LF motor is controlled by this data, and the hammer solenoid is turned on.

Block diagram

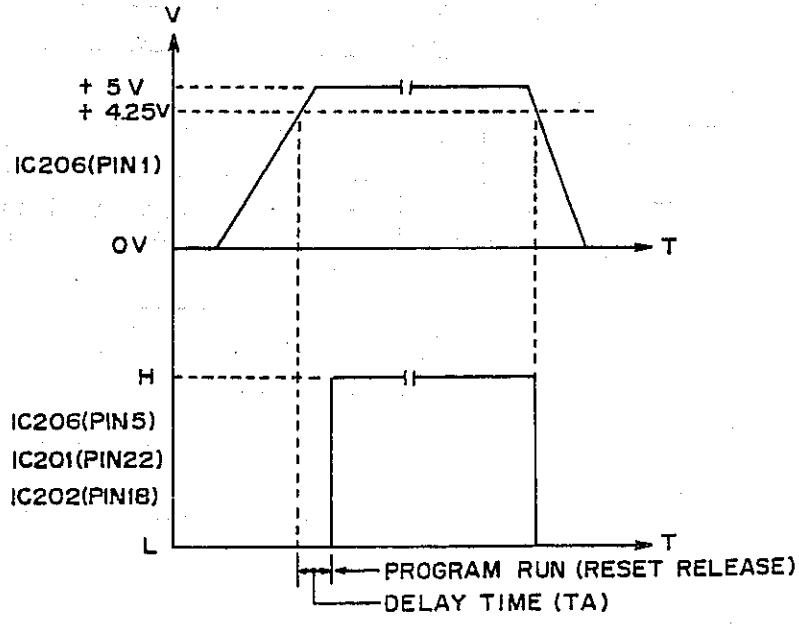


## 3.3 Reset/Delay Circuit

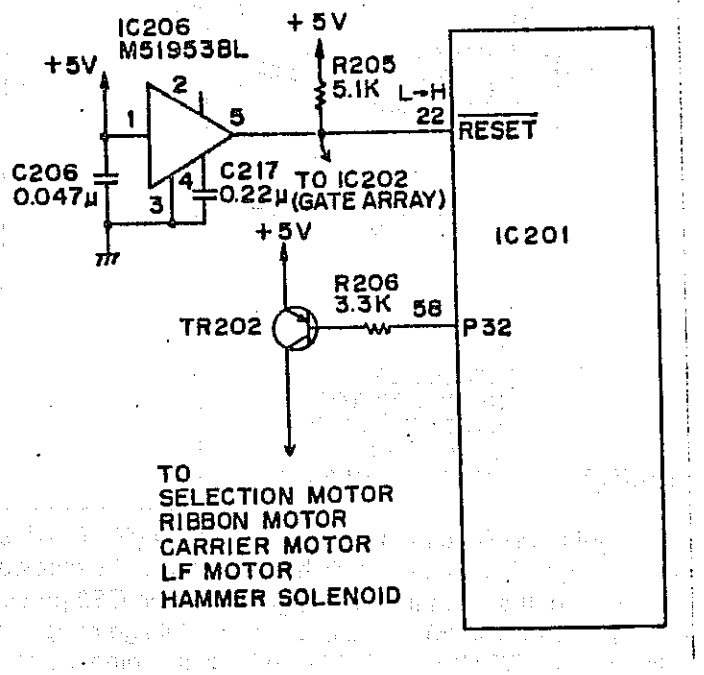
This circuit is used to reset the CPU (IC201), gate array (IC202), and control circuits, to operate the motor drive circuits, and to switch the initial voltage (+5.0V delay output).
When the power is turned on, the reset/delay circuit works to reset and initialize the CPU (IC201) and gate array (IC202) functions and to supply current to the motor drive circuits before the CPU (IC201) starts executing its program so that the motors operate correctly. In addition, when the power is turned off, the reset/delay circuit works to reset the CPU (IC201) and gate array (IC202) functions again and prevent misoperation of the motors.



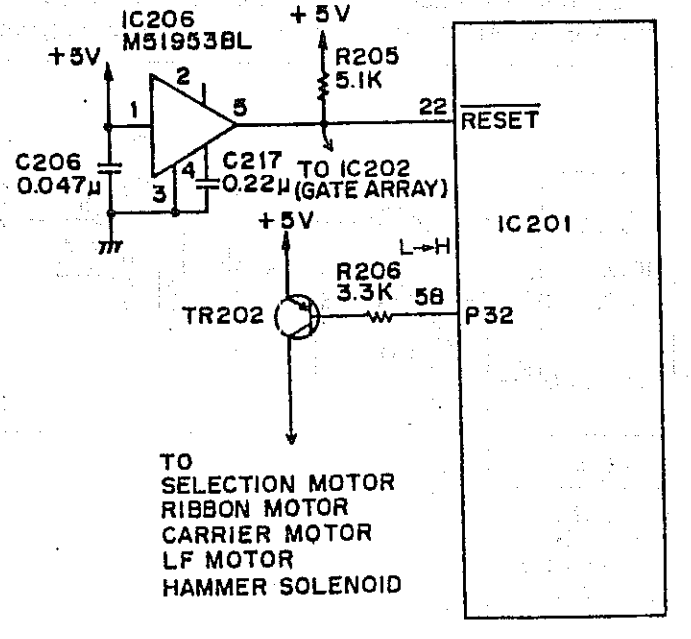

As shown in the illustration, IC206 is a reset IC in which, when the signal for pin 1 of IC206 rises to +5.0V, the voltage on the input pin (pin 2) exceeds approximately +4.25V (after a delay of TA seconds) and the output pin (pin 5) switches from low (0V) level to high (+5.0V) level.



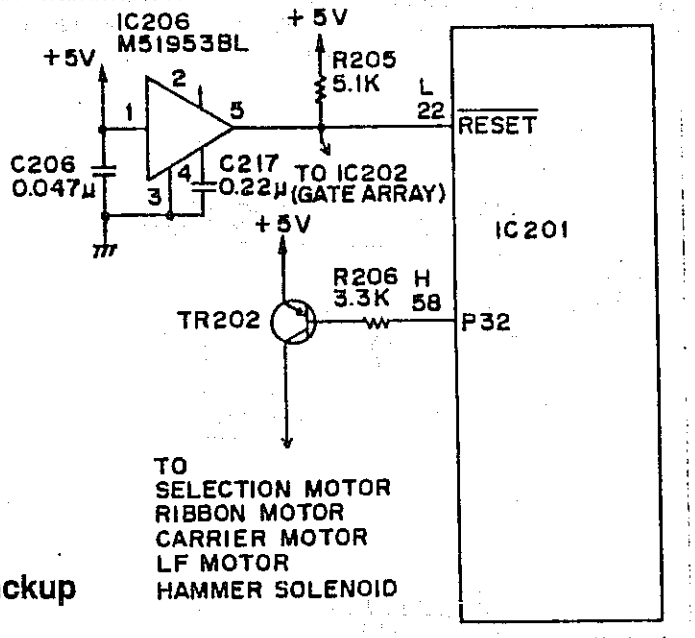
1) When the power is turned on, the output pin (pin 5) stays at low level until the input pin (pin 1) of the reset IC (IC206) reaches +4.25V. At this point, the $\overline{\text{RESET}}$ input port (pin 22) of the CPU (IC201) and the reset input port (pin 18) of the gate array (IC202) are reset to the same electric potential (low level).
If the +5.0V power supply exceeds +4.25V, the output pin (pin 5) of the reset IC (IC206) goes to high level; when the $\overline{\text{RESET}}$ input port (pin 22) of the CPU (IC201) and the reset input port (pin 18) of the gate array (IC202) also go high, the reset are released, the CPU (IC201) and the gate array (IC202) begins to operate and the program starts.




2) Once program execution starts, the P32 port (pin 58) of the CPU (IC201) switches from high level to low level. Once this happens, current flows from the +5.0V power supply via the resistor (R206) so that the transistor (TR202) turns on and the initial voltage (+5.0V) is supplied to the motor drive circuits.
In this way, the initial voltage is the voltage first supplied after the start of the +5.0V supply voltage and the operation of the logic circuits. Therefore, current does not flow to the motors or hammer solenoid if the CPU (IC201) is not operating.



3) If the power is turned off or the voltage falls and the voltage of the input pin (pin 1) of the reset IC (IC206) falls to +4.25V, the output voltage switches to low level and the RESET port (pin 22) of the CPU (IC201) and the reset input port (pin 18) of the gate array (IC202) also switches to low level. In this case, the P32 port (pin 58) of the CPU (IC201) goes to high level, the transistor (TR202) is turned off, and the supply of initial voltage to the motor and hammer solenoid is cut off.

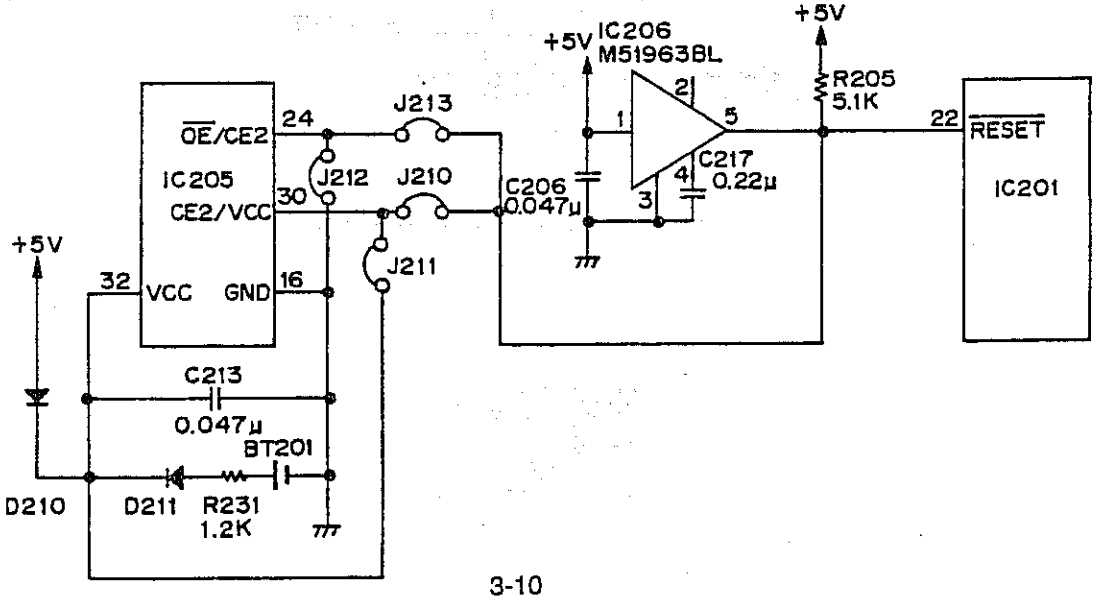



## 3.4 Memory Backup

This typewriter is equipped with a memory backup battery (BT201) designed to maintain store data in RAM (IC205) even if the power switch is turned off. If the power switch is turned off and output port (pin 5) of the reset IC (IC206) goes low, the CE2 port of RAM (IC205) also goes low, putting the RAM (IC205) in standby mode. Voltage of approximately +3.0V is then supplied from the battery (BT201) to RAM (IC205), maintaining the store data.

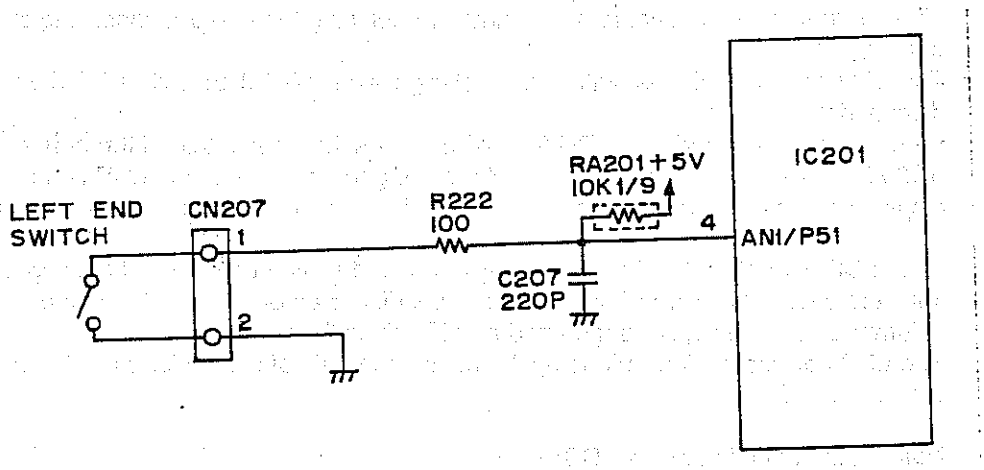
**CAUTION!**
Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Discard used batteries according to manufacturer's instructions.

**Vorsicht!**
Bei falschem Auswechseln der Batterie Explosionsgefahr. Nur mit selben oder gleichwertigen vom Gerätehersteller empfohlenen Batterietyp ersetzen. Verbrauchte Batterien entsprechend der Herstelleranweisung entsorgen.



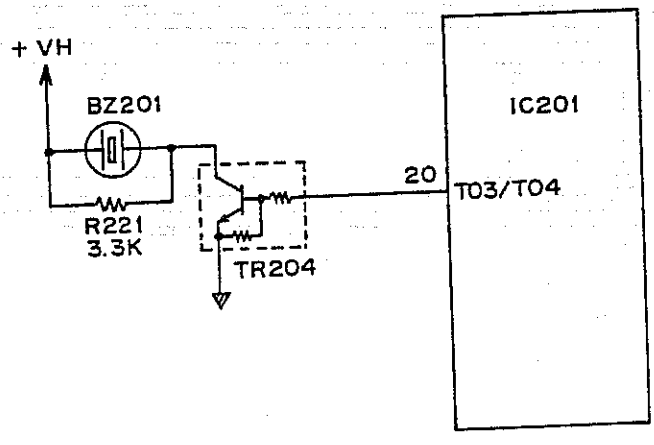
## 3.5 Left End Switch

When the power is turned on, the carrier moves to the left. At this point, the left end switch in the carrier box is off and the AN1/P51 port (pin 4) of the CPU (IC201) is at high level. When the left frame adjustment screw strikes the left end switch in the carrier box, the left end switch turns on and the AN1/P51 port (pin 4) of the CPU (IC201) goes low; the CPU thus recognizes that position as the left end position (carrier home position). (If, during the initial operations, the carrier moves 1,240 steps without finding the left end position (carrier home position), the beeper sounds and the unit halts all functions.)
In addition, the carrier moves to the margin "0" point, in relation to this position.




## 3.6 Beeper Circuit

The beeper used in this typewriter is a piezoelectric beeper. When voltage is supplied to this beeper in pulses at a given frequency, the beeper sounds by vibrating at the same frequency. The TO3/TO4 port (pin 20) of the CPU (IC201) outputs a square wave; when the corresponding transistor (TR204) is turned on, the beeper sounds.

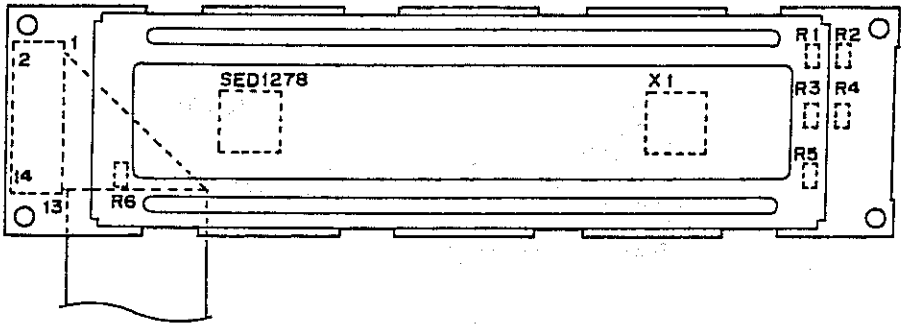


## 3.7 LCD

The LCD, designed to minimize the number of components, consists of an STN (super twist nematic) -type liquid crystal display element and panel, and a PCB equipped with a control IC (SED1278) and a segment driver IC (X1). When the LCD fails, the entire LCD unit is replaced; components on the PCB are not replaced.
Unlike conventional LCDs, the liquid crystal layer of an STN-type liquid crystal display twists through 180° to 270°; the display also has an orientation layer with a high tilt angle, so that the viewing characteristics of the display are improved.
The display configuration consists of 100 columns in the segment lines and 16 rows in the column lines, for a total of forty segments.
One segment is equivalent to one character (including the cursor), consisting of 5 columns by 8 rows.
The LCD controller IC has built-in character generator ROM as well as RAM used for storing display data.
When a key is pressed, the CPU (IC201) converts the data obtained through the gate array (IC202) so that it can be used by the character generator within the LCD controller IC. The display data is then output to the LCD in synchronization with the controller IC's internal clock.

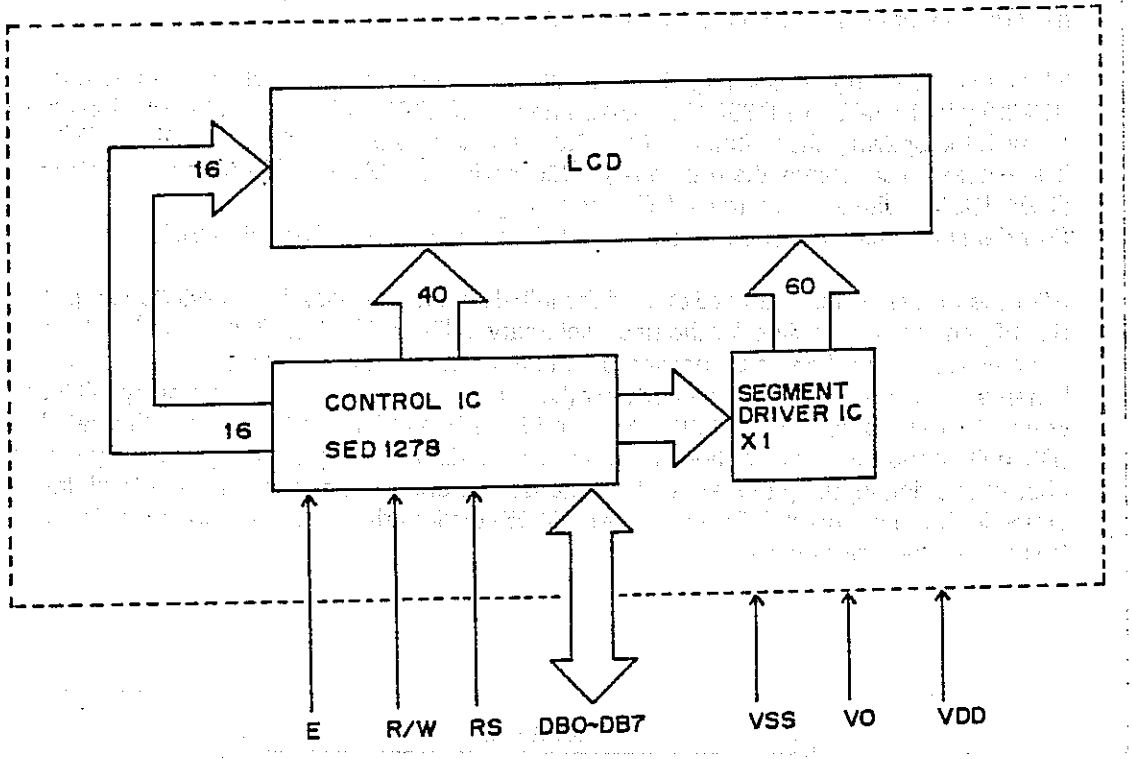
If the LCD controller IC fails, the display does not function correctly. If the segment driver IC fails, the characters formed by that IC are not displayed properly. The controller IC drives 40 columns and 16 rows; the segment driver IC drives 60 columns.
The LCD contrast is determined by the resistance ratio of two resistors (R228 and R229) on the control PCB.

Note on the handling of the LCD:
Pressing hard on the LCD or bending the PCB can cause the unit to fail. Overvoltage, static electricity, and electrical noise can cause the unit to operate incorrectly.
The operating temperature and humidity are the same as for the typewriter. If the LCD is used in cold temperatures, its response time may become slower.
If there is a change in the operating temperature or drive voltage, the hue of the LCD will change somewhat.



Pin description

| Pin Name | Pin No. On LCD | Pin No. On Control PCB | Function |
|---|---|---|---|
| DB7-DB0 | 14-7 | 1-8 | LCD screen data I/O signals |
| E | 6 | 9 | Enable input signal |
| R/W | 5 | 10 | Data write and read signals |
| RS | 4 | 11 | Register selection input signal |
| VO | 3 | 12 | Liquid crystal drive voltage input |
| VDD | 2 | 13 | Logic circuitry voltage input (+5V) |
| VSS | 1 | 14 | Ground (0V) |



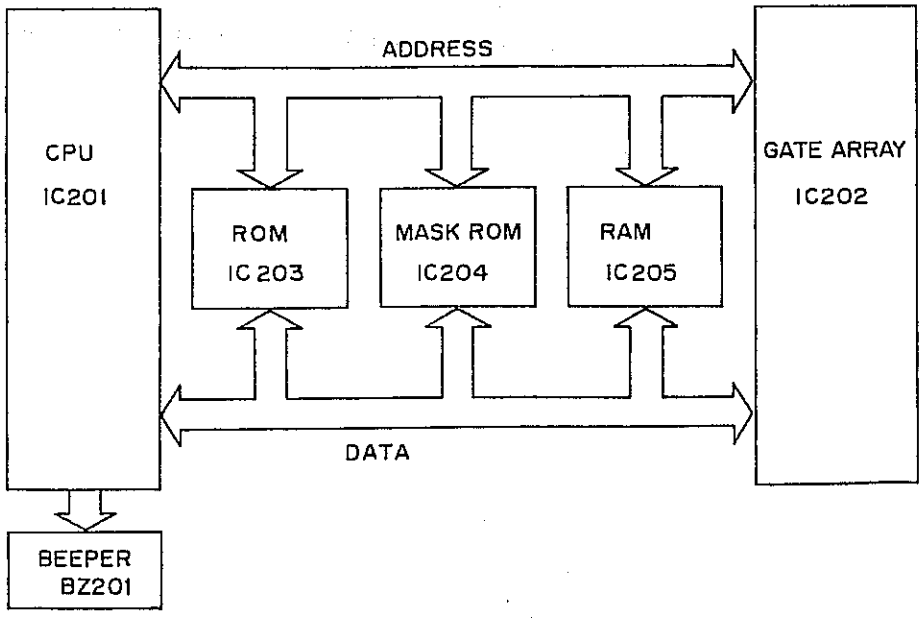
## 3.8 Spelling Check (if applicable)

When the character string that was input is judged to be a word, the spelling check function compares that word with the words in the main dictionary (mask ROM (IC204) or 4M bit mask ROM (IC203)) and the user dictionary (RAM (IC205)).
If the character string does not match any of the words in the dictionaries, the typewriter beeps, indicating that a misspelling was detected.

This typewriter is equipped with spelling check dictionaries for four languages.
The American (80,000 words) and Spanish (184,000 words) dictionaries can be used with the Spain and Hispano keyboards.
The American (80,000 words) and French (136,000 words) dictionaries can be used with the France and Canada-France keyboards.
The American (80,000 words) and German (150,000 words) dictionaries can be used with the Germany keyboard.
The American (80,000 words) dictionary can be used with the U.S.A. and U.K. keyboards.
In addition, it is also possible to register frequently used (necessary) words in the user dictionary (equivalent to approximately 300 ten-latter words).

When implementing the spelling check function, it is necessary to replace the gate array (IC202) with the NEC μPD65006CW-A22 and the EP ROM (IC203) with the version compatible with the spelling check function (ver. 2.0_) and to add a mask ROM for IC204. Otherwise, it is necessary to replace the gate array (IC202) with the NEC μPD65006CW-A22 and the EP ROM (IC203) with a 4M bit mask ROM (ver. 3.0_).
(For details on installation, refer to section 5.2, "Keyboard and Control PCB.")

After the power switch is turned on and the initialization operation is completed, the gate array (IC202) checks the backup for the user dictionary in RAM (IC205). (If the data for the registered words is found not to be backed up, the typewriter beeps five times.)
When a key is pressed and the character (key scan) data is input, the gate array (IC202) sends the data to the CPU (IC201) via the address bus (A0 to A18 ports) and the data bus (D0 to D7 ports); the data is then stored in RAM (IC205). If a space or symbol is typed, the character string input up to that point is regarded as one word and is compared with the words in the main (mask ROM) and user (IC205) dictionaries. If a matching word is not found, the typewriter beeps.



## 3.9 Initial Operations (Initialization)

When the current for the typewriter is turned on, the initial operations are performed in the following sequence.

1) Power supply on, power on LED, beeper
   When the power switch is turned on, the power on LED lights and the beeper sounds.

2) Carrier motor 1
   The carrier motor turns 60 steps in the clockwise direction (to the right) and the carrier moves to the right.

3) Carrier motor 2
   The carrier motor turns 36 steps in the counterclockwise direction (to the left) and carrier moves to the left.

4) Ribbon motor 1
   The ribbon motor turns 152 steps in the counterclockwise direction (to the left), and the correct cam is set to the predetermined position (home position).

5) Ribbon motor 2
   The ribbon motor turns 76 steps in the clockwise direction (to the right), and the ribbon cassette base is lifted.

6) Selection motor 1
   The selection motor turns 500 steps in the counterclockwise direction (to the left), and the printwheel is set to the selection gear.

7) Ribbon motor 3
   The ribbon motor turns 86 steps in the clockwise direction (to the right), and the ribbon cassette base is lowered.

8) Ribbon motor 4
   The ribbon motor turns 15 steps in the counterclockwise direction (to the left), and the ribbon tape is wound up.

9) Carrier motor 3
   The carrier motor turns 1,240 steps in the counterclockwise direction (to the left) and the carrier moves to the left.
   Then the carrier motor turns 2 steps in the clockwise direction (to the right), and the carrier moves to the right.
   The carrier moves a maximum of 8 steps to the left until the left end switch turns on. In addition, the four-step carrier moves to the left.
   If after the carrier is moved to the left the left end switch still does not turn on, the beeper will sound and all functions will stop.

10) Selection motor
    After the selection motor rotates 208 steps in the counterclockwise direction (to the left) (the left frame main shaft bracket pushes the wheel set hook, during which interval the selection gear locks), the selection gear rotates the selection motor 16 steps in the clockwise direction (to the right) from the "step out" position, and in the specified excitation phase the printwheel is set to the home position (for printwheels for the U.S.A., this is the position where the period (".") is at the top.)

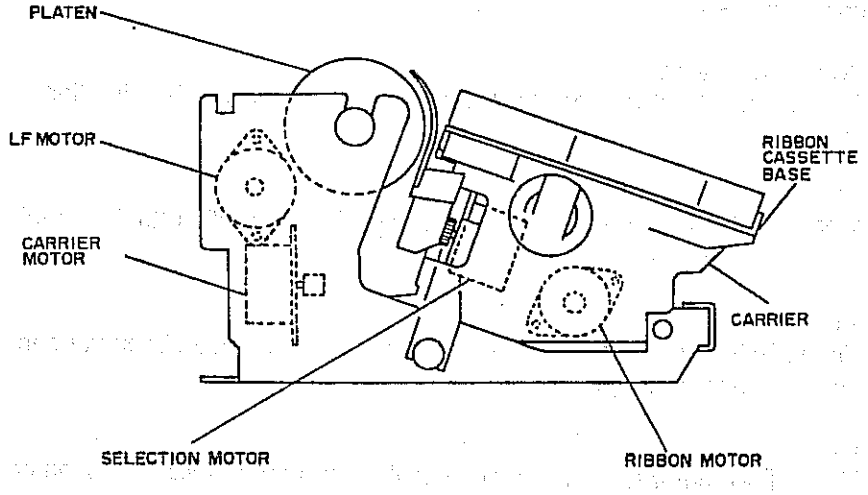
11) LF (line feed) motor
In order to determine the reference excitation phase, the LF motor turns 32 steps in the clockwise direction (to the right) and then turns 32 steps in the counterclockwise direction (to the left).

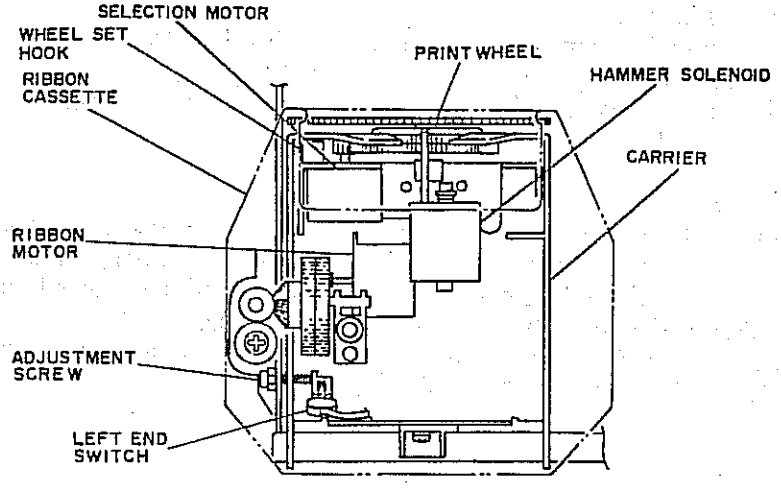
12) Carrier motor 4
The carrier motor turns 26 steps in the clockwise direction (to the right), and the carrier moves to the margin "0" position. The carrier then moves to the left margin position.

After the above initial operations are completed, the CPU (IC201) begins normal key scan operation.
The ▼ symbol is displayed above the normal printing indicator on the LCD.

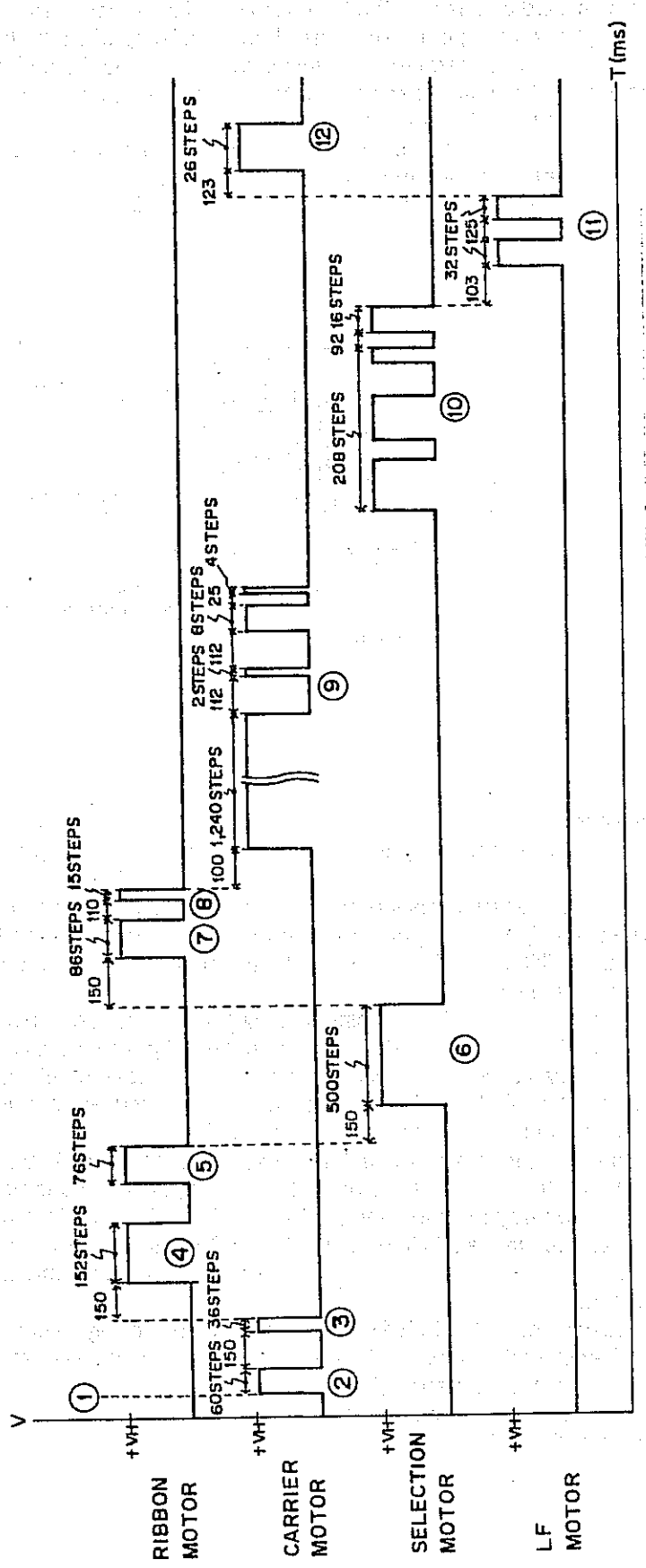
Note:
The directions referred to in the above explanation are when viewed from the output axis side.
The "output axis side" is the side of the gear, etc., to which pressure is applied.

Carrier



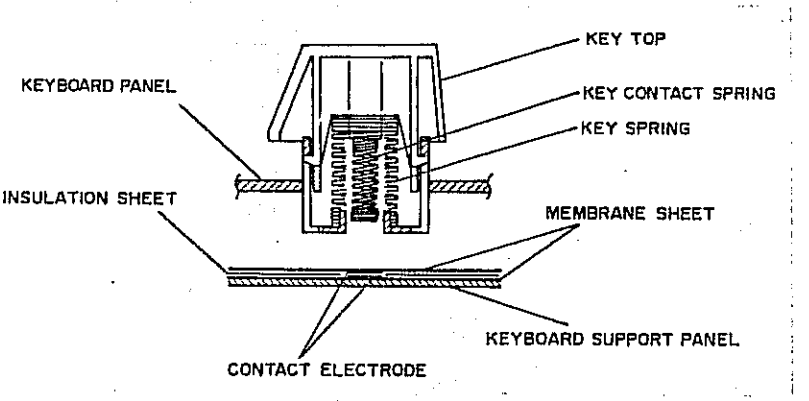



Initial operations timing chart

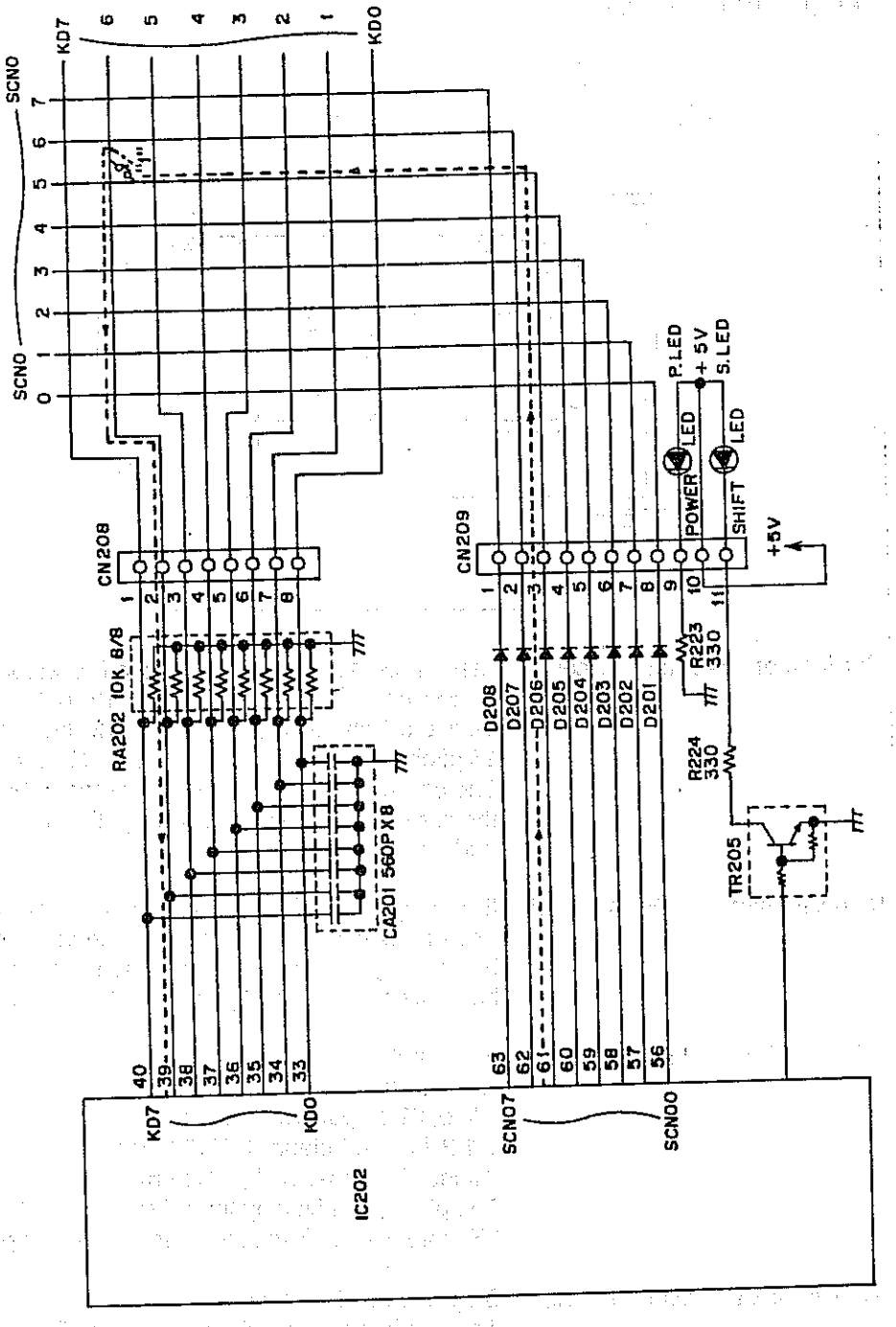


## 3.10 Keyboard and Key Scan

1) Keyboard
The keyboard consists of: the keyboard panel assembled from keytops, contact springs, and keytop springs; the membrane sheet consisting of a top electrode sheet and a bottom electrode sheet separated by an insulating sheet; and the keyboard support panel.
The top electrode sheet and the bottom electrode sheet are normally kept apart by the insulating sheet, so that the circuits are open.
When a keytop is pressed, the contact spring within the keytop presses the top electrode (carbon contact) on the membrane sheet so that it comes into contact with the bottom electrode sheet (carbon contact), closing the circuit.

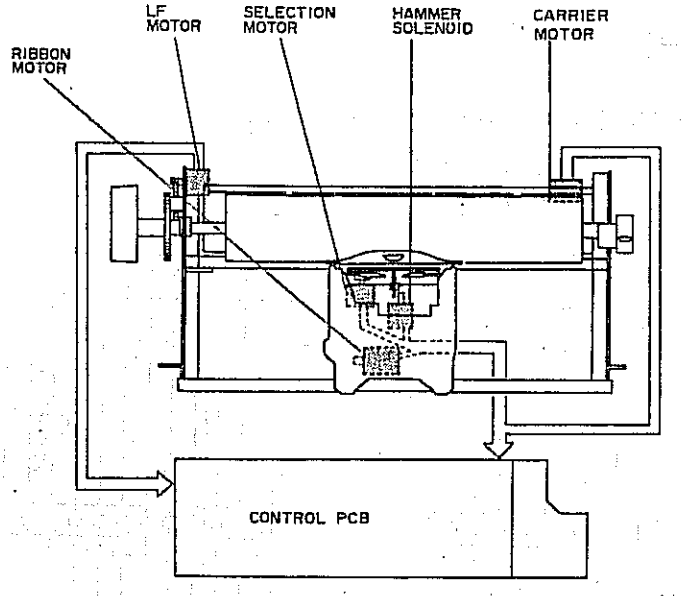



2) Key scan
The membrane sheet is printed with a circuit pattern forming an 8 column × 8 row key matrix.
After the power supply is turned on and the initial operations are completed, a 15/8msec pulse scan signal is output in sequence from the output ports (SCN00 to SCN07) of the gate array (IC202). (The electric potential of each port is continuously changed from low level to high level.)
Because KD0 to KD7 ports (pins 33 to 40) of the gate array (IC202) are kept at low level by the resistor array (RA202), they will not go high as long as no keys are pressed.
The key scan cycle takes 15msec; when two key scan results match, they are considered valid and the CPU (IC201) controls the drive circuit used for printing and operates the actuators for the motors and hammer solenoids, etc.
As shown in the illustration, if the "1" key is pressed, the circuit is closed at SCN05 (column) and KD2 (row). At this point, the scan signal (low) output from SCN05 port (pin 61) of the gate array (IC202) changes KD2 port (pin 35) from low to high. The gate array (IC202) then sends this information to the CPU (IC201) over the data bus (D0 to D7 ports). The CPU (IC201) reads this state and recognizes that the "1" key has been pressed.
In addition, the CPU (IC201) is equipped with a two-key rollover system that does not accept key input if information indicating that three keys were pressed simultaneously is received from the gate array (IC202).
The shift LED is lit when the SLED port (pin 24) of the gate array (IC202) is high and the transistor (TR205) is turned on.


SCN0
SCN0
KD7
KD0
CN208
RA202 10K 8/8
CA201 560PX8
CN209
D208
D207
D206
D205
D204
D203
D202
D201
R223 330
R224 330
P.LED
+5V
S.LED
POWER LED
SHIFT LED
+5V
TR205
IC202
KD7
KD0
SCN07
SCN00

## 3.11 Motors, Solenoid, and Drive Circuits

1) Location and function of motors
This typewriter uses four stepping motors and a hammer solenoid in order to move the printing mechanisms. The stepping motors and hammer solenoid are controlled by the CPU (IC201) through the motor and hammer solenoid drive circuits on the control PCB.




| | |
|---|---|
| Carrier motor (+VH) (27Ω/coil) | Step angle: 15° (24 steps/rotation (1/2 step/character))<br>10 pitch: 1 character, 12 steps, 1/10" (2.54mm)<br>12 pitch: 1 character, 10 steps, 1/12" (2.12mm)<br>15 pitch: 1 character, 8 steps, 1/15" (1.69mm)<br>The carrier is moved by the carrier motor by means of the carrier motor gear, the drive pulley, the idle pulley, and the drive belt. |
| Selection motor (+VH) (42Ω/coil) | Step angle: 15° (24 steps/rotation (2 steps/character))<br>The printwheel is mounted on the selection gear, which is driven by the selection motor gear. The character to be printed is selected by rotating the motor. |
| LF motor (+VH) (45Ω/coil) | Step angle: 15° (24 steps/rotation)<br>1/2 line, 16 steps, 1/12" (2.12mm)<br>1 line, 32 steps, 1/6" (4.23mm)<br>1-1/2 lines, 48 steps, 1/4" (6.35mm)<br>2 lines, 64 steps, 1/3" (8.47mm)<br>The platen is driven by the LF motor by means of the LF motor gear, LF middle gear, and platen gear. |
| Ribbon motor (+VH) (42Ω/coil) | Step angle: 15° (24 steps/rotation)<br>The number of steps changes, depending on differences in the character or the ribbon cassette. The rotation of the ribbon motor winds the ribbon and lifts the cassette base when corrections are made. |
| Hammer solenoid (+VH) | Used to strike the hammer. |

2) Operating principles and timing

The four-phase stepping motors used in this typewriter are driven by two-phase excitation. Each stepping motor has two coils, and each coil is separated into four phases (A, $\overline{A}$, B, and $\overline{B}$).

The stator around which the coil is wound and the rotor with permanent magnets are designed so that they normally turn at the same step angle.

To drive the motor, +VH voltage is applied to the common line; if two phases (AB or $\overline{AB}$) are excited, the attractive and repulsive power of the magnetic forces cause the rotor to move one step.

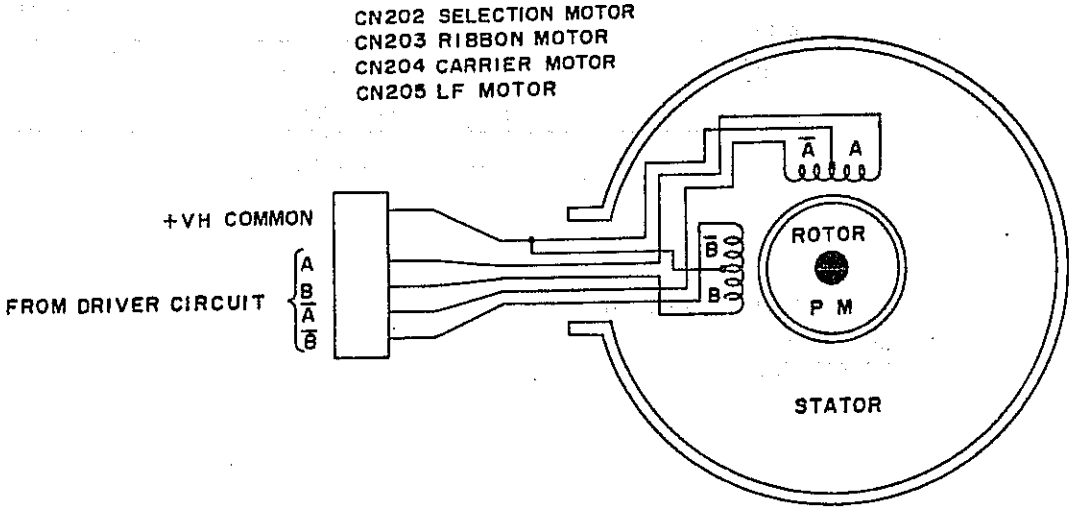
The motor continues to rotate by constantly switching these two phases.

In order to rotate the motor, the two phases are continuously switched according to the following sequence. There is never an instance where both A and $\overline{A}$ or B and $\overline{B}$ are excited at the same time.

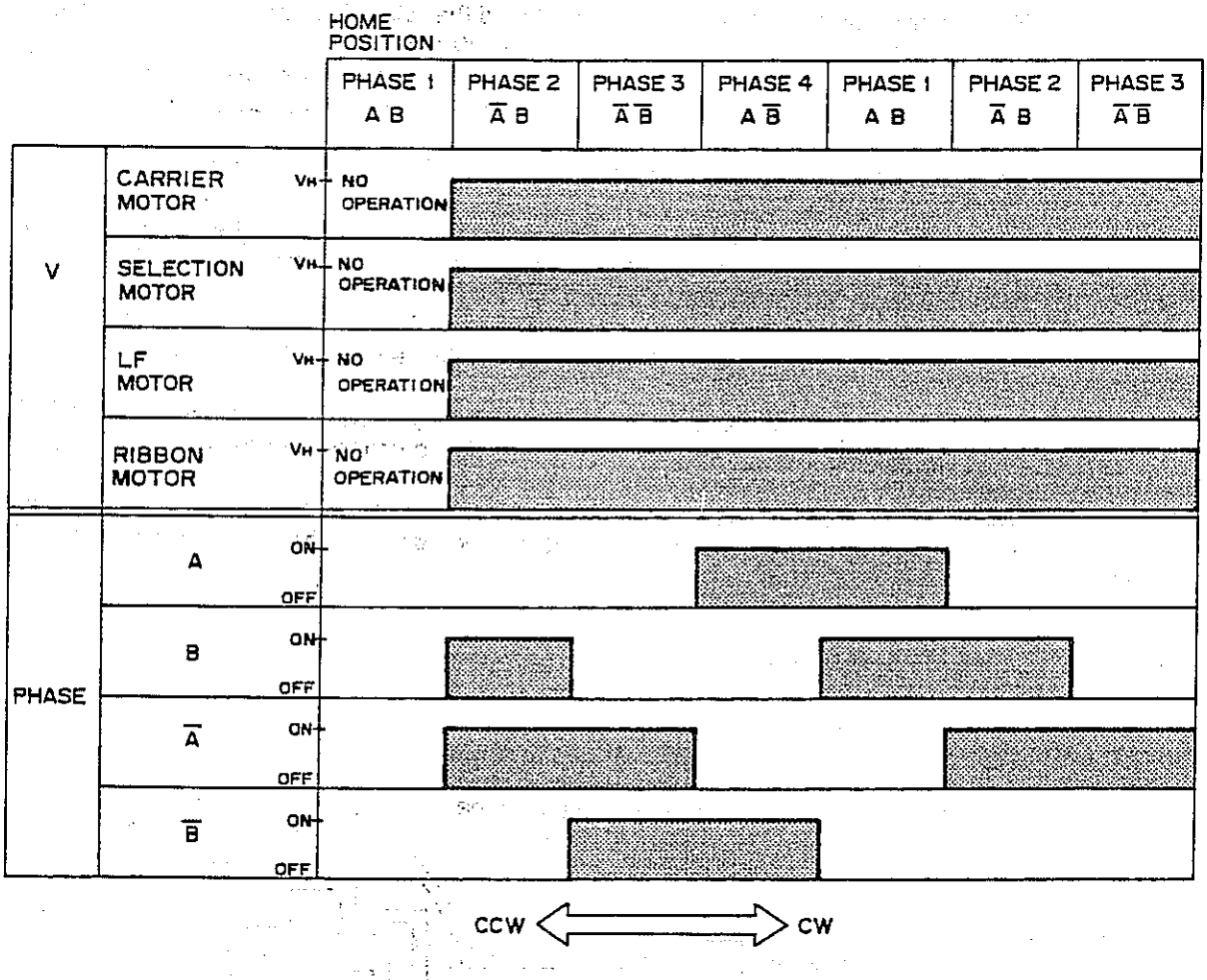
Phase 1 AB → Phase 2 $\overline{A}$B → Phase 3 $\overline{AB}$ → Phase 4 A$\overline{B}$ → Phase 1 AB ...

The selection motor is designed so that +VH voltage apart from the drive voltage (+VH) is continuously switched on and off, acting as holding voltage in order to maintain the home position.

The LF motor, carrier motor, and ribbon motor do not have hold voltage used to maintain a fixed position. Therefore, only the +VH voltage used as the drive voltage is applied to these motors.



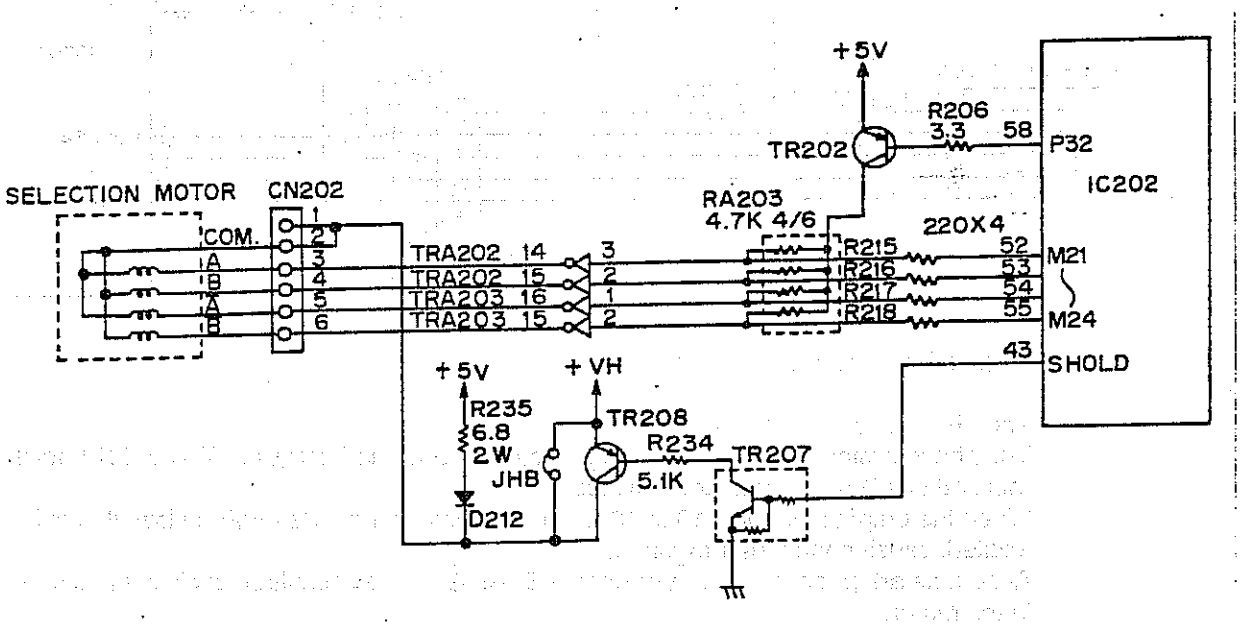
Timing chart for the selection, carrier, LF and ribbon motors




V: Voltages applied to the motors
CW: Clockwise
CCW: Counterclockwise

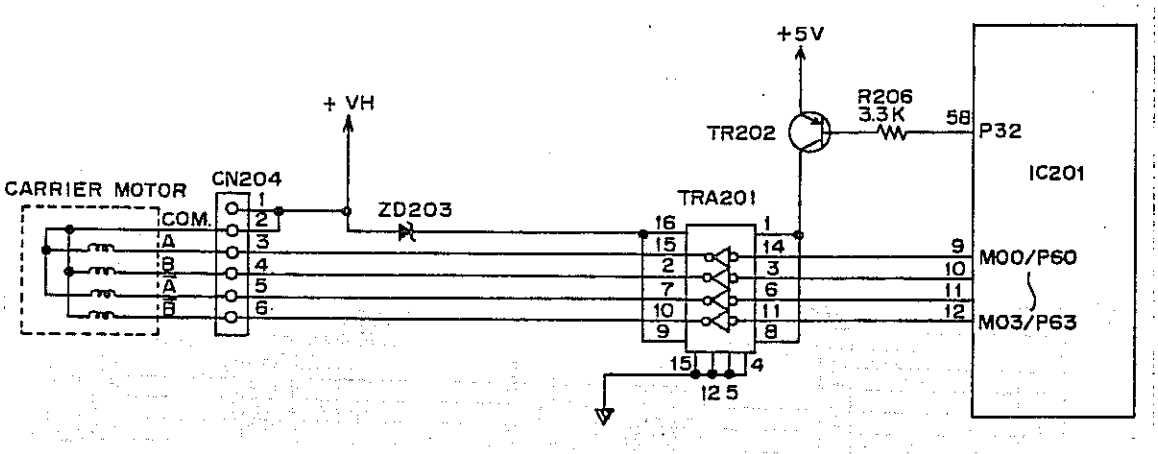
3) Motor drive circuits

Selection motor:
The selection motor is driven and held by +VH voltage.
If the SHOLD port (pin 43) of the gate array (IC202) is high, the transistor (TR207) turns on. At the same time, transistor (TR208) also turns on, and the output voltage (+VH) from transistor (TR208) is applied to the common line.
The phase switching used to rotate the motor is performed using the M21 to M24 ports (pins 52 to 54) of the gate array (IC202). If the output pins (pins 14 and 15) of transistor array (TRA202) and the output pins (pins 16 and 15) of transistor array (TRA203) and go low, the coil is excited, causing the motor to rotate. At no time are phases A and $\overline{A}$ or phases B and $\overline{B}$ excited simultaneously in the same coil in the motor.
The output signals from M21 to M24 ports (pins 52 to 54) of the gate array (IC202) repeatedly excite the four phases A, B, $\overline{A}$, and $\overline{B}$ in order to rotate the motor.



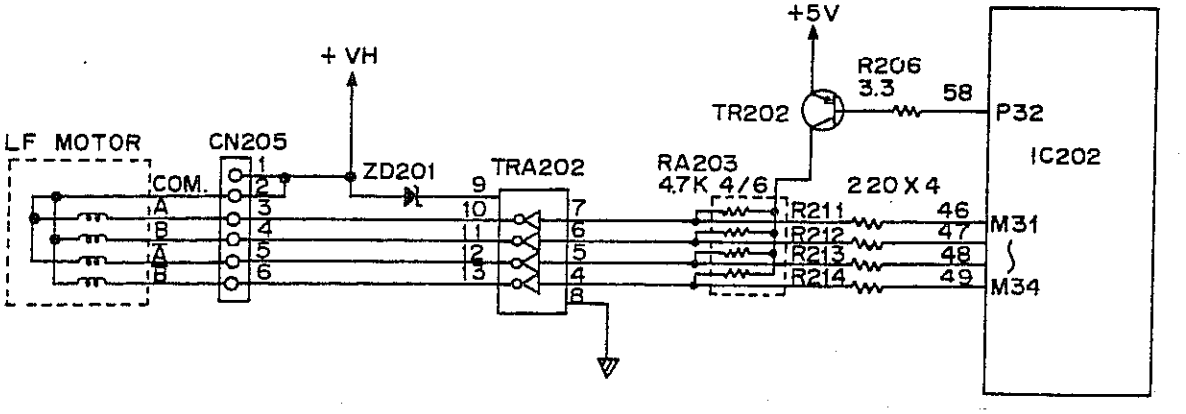
Carrier motor:

The carrier motor is driven by +VH voltage.
The phase switching used to rotate the motor is performed using the M00/P60 to M03/P63 ports (pins 9 to 12) of the CPU (IC201). When the output pins (pins 2, 7, 10, and 15) of the transistor array (TRA201) go low, the coil is excited, causing the motor to rotate.
At no time are phases A and $\overline{A}$ or phases B and $\overline{B}$ excited simultaneously in the same coil in the motor.
The output signals from the M00/P60 to M03/P63 ports (pins 9 to 12) of the CPU (IC201) repeatedly excite the four phases A, B, $\overline{A}$, and $\overline{B}$ in order to rotate the motor.
The reverse voltage generated during the rotation of the motor is cut off by the zener diode (ZD203).

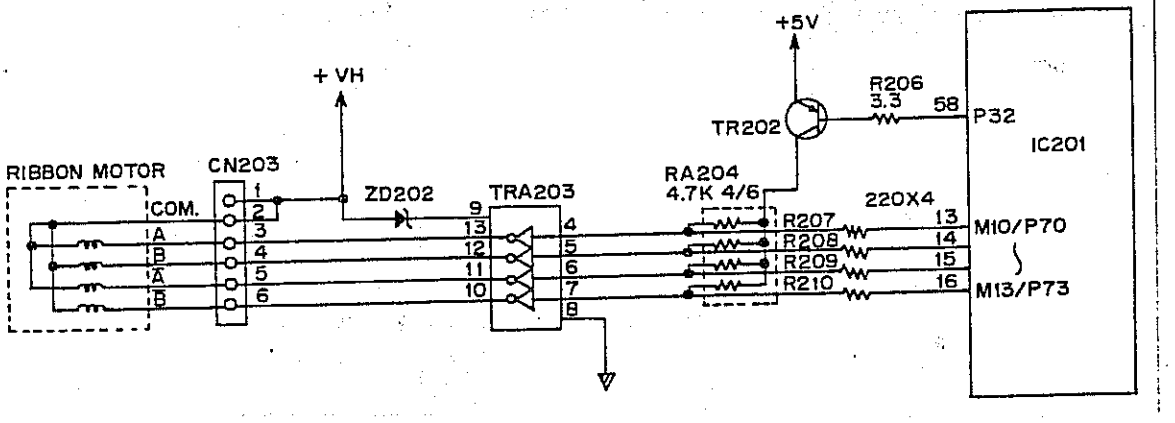



LF (line feed) motor:

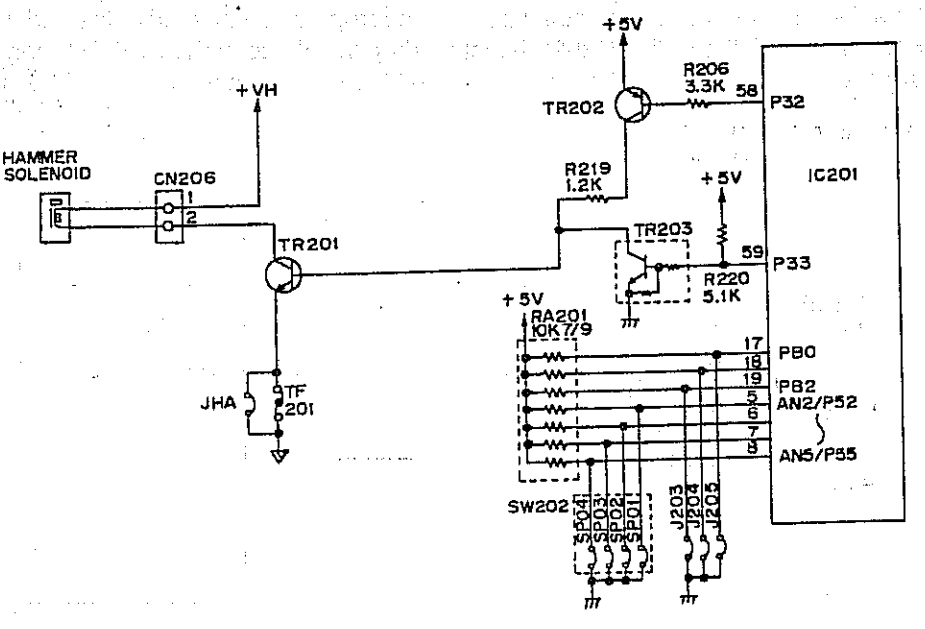
The LF motor is driven by +VH voltage.
The phase switching used to rotate the motor is performed using the M31 to M34 ports (pins 46 to 49) of the gate array (IC202).
When the output pins (pins 10 to 13) of the transistor array (TRA202) go low, the coil is excited, causing the motor to rotate.
At no time are phases A and $\overline{A}$ or phases B and $\overline{B}$ excited simultaneously in the same coil in the motor.
The output signals from M31 to M34 ports (pins 46 to 49) of the gate array (IC202) repeatedly excite the four phases A, B, $\overline{A}$, and $\overline{B}$ in order to rotate the motor. The reverse voltage generated during the rotation of the motor is cut off by the zener diode (ZD201).



Ribbon motor:
The ribbon motor is driven by +VH voltage.
The phase switching used to rotate the motor is performed using the M10/P70 to M13/P73 ports (pins 13 to 16) of the CPU (IC201). When the output pins (pins 10 to 13) of the transistor array (TRA203) go low, the coil is excited, causing the motor to rotate.
At no time are phases A and $\overline{A}$ or phases B and $\overline{B}$ excited simultaneously in the same coil in the motor.
The output signals from the M10/P70 to M13/P73 ports (pins 13 to 16) of the CPU (IC201) repeatedly excite the four phases A, B, $\overline{A}$, and $\overline{B}$ in order to rotate the motor.
The reverse voltage generated during the rotation of the motor is cut off by the zener diode (ZD202).

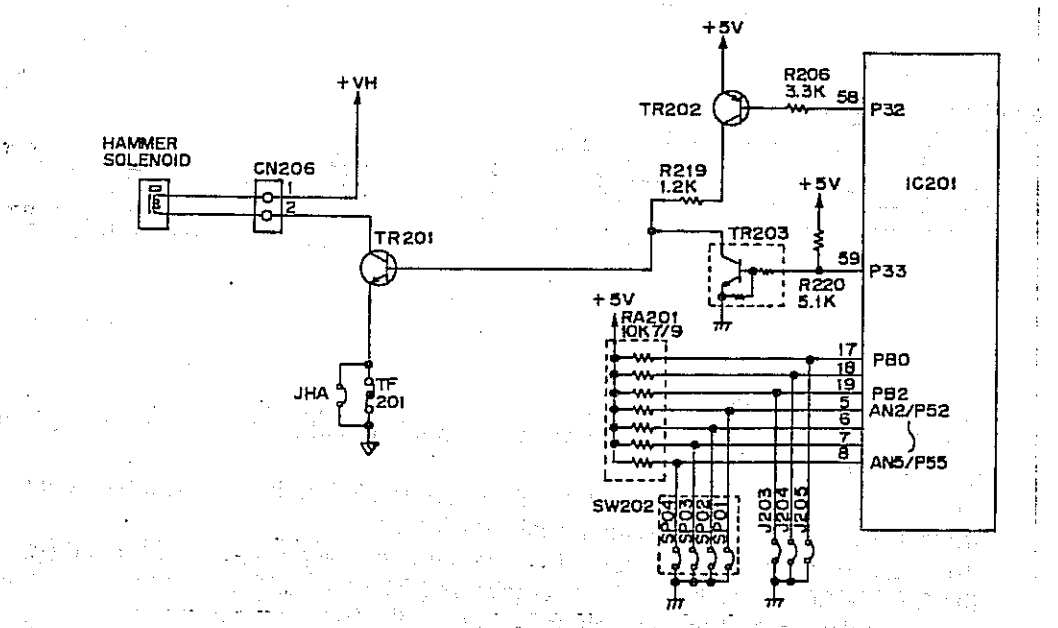



Hammer solenoid drive control:
The timing signal that turns the hammer solenoid on and off is output by the P33 (pin 59) port of the CPU (IC201).
When the hammer solenoid is off, the P33 port (pin 59) of the CPU (IC201) is high, the transistor (TR201) is off, and the transistor (TR203) is on.
When a key is pressed, in order to turn the hammer solenoid on, the P33 port (pin 59) of the CPU (IC201) goes low and the transistors (TR201 and TR203) are off, which allows current to flow to the hammer solenoid, causing the hammer to strike.
The hammer solenoid "on" time for each character can be set by software; using SW202, each character can be set to a total of five levels.



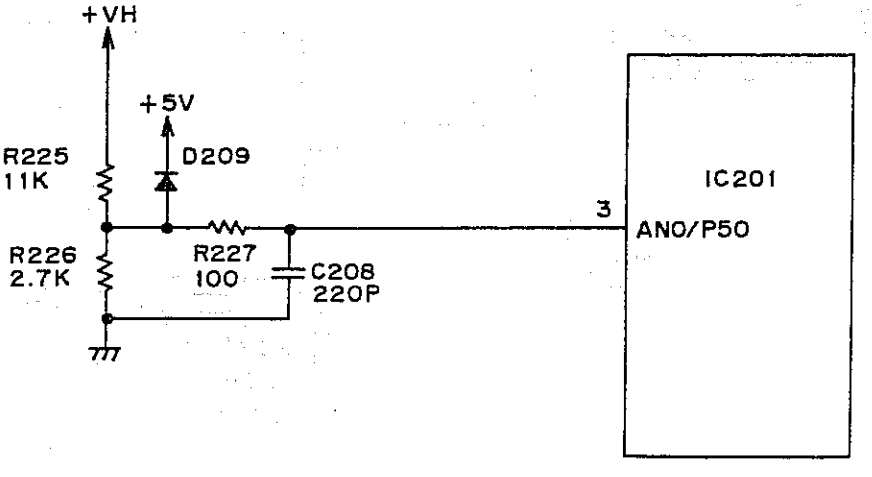
## 3.12 Printing Impression

Time control (ROM:IC203):
The printing impression can be changed for each character depending on the size of the character, providing for clear printing.
The hammer solenoid "on" time (the length of time the hammer solenoid operates) is controlled by using the program data in the ROM (IC203) to control the length of time that the P33 port (pin 59) of the CPU (IC201) is low. If a character is large, this time is longer; if a character is small, this time is shorter.
The "on" time for each character is programmed into the ROM (IC203) and cannot be changed. In addition, a variable resistor or similar device is not used to control the amount of current flowing to the hammer solenoid; it is possible to make similar adjustments through the software by leaving the pins for SW202 (SP01 to SP04) open or closed.




## 3.13 +VH Level Detection

Because the +VH voltage is unstable, the CPU (IC201) looks for voltage variations and controls the voltage through the software at an appropriate level to drive the various mechanisms. For example, if the CPU (IC201) detects a drop in voltage at the AN0/P50 port (pin 3), the program software automatically changes so that the hammer solenoid "on" time increases.



## 3.14 Printing Cycle

One-character printing:

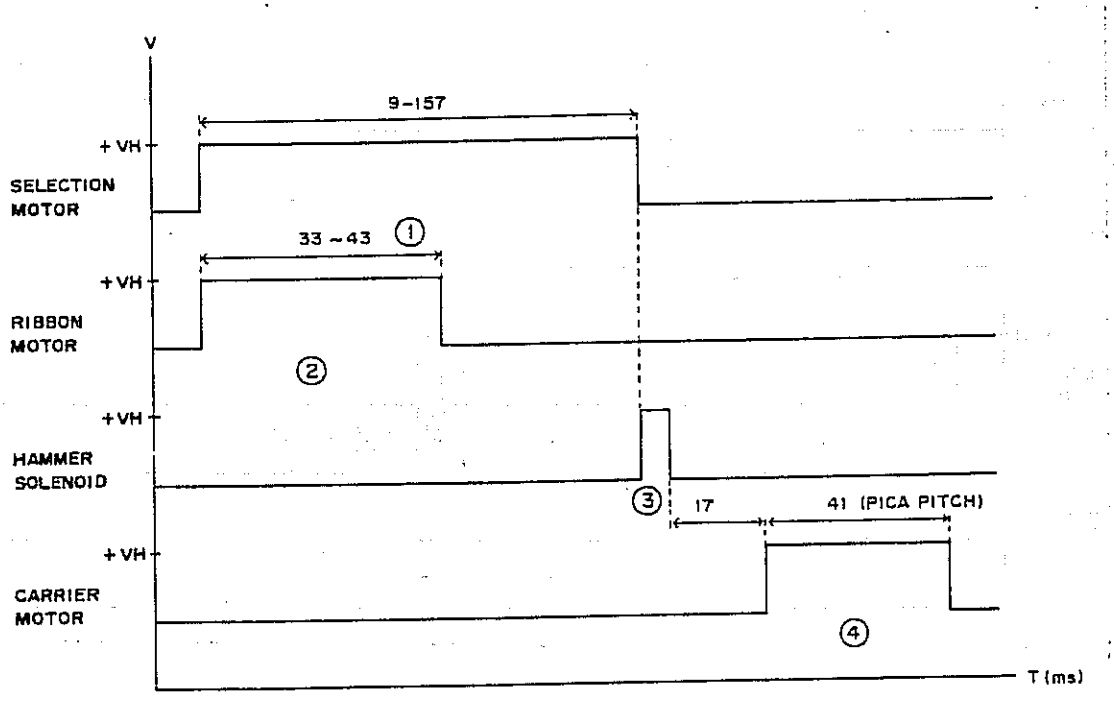
1) If a key is pressed, the CPU (IC201) rotates the selection motor to the position for that character, moving the character on the printwheel to be printed to the hammer solenoid position. Then, +VH voltage is intermittently supplied (the voltage is switched on and off repeatedly) in order to keep the character at that position.

2) The ribbon motor rotates, moving the ribbon to the printing position.

3) Because the printwheel moves at high-speed, a damping effect occurs. Once the damping effect is absorbed, the hammer solenoid is turned on.

4) After the hammer solenoid turns off (approximately 17msec), the carrier motor rotates to move the carrier to the next printing position.

5) If there is no key input within a certain period of time, the printwheel returns to the home position. (In the case of the printwheel for the U.S.A., the period (".") returns to the top position.)



Continuous printing (when key input data is in the buffer):
To perform continuous printing, the following operation is performed after one-character printing.

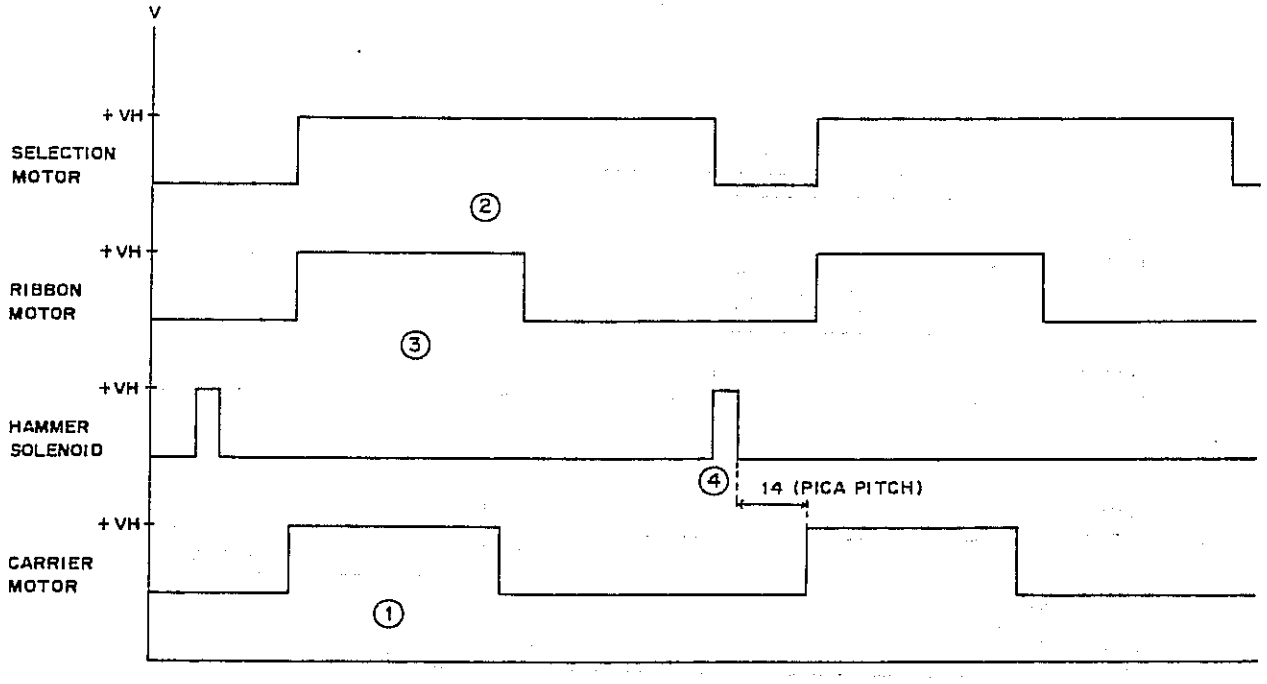
1) The carrier motor moves the carrier to the next printing position.

2) The printwheel is turned by the selection motor from the character that was just printed to the character to be printed next.

3) The ribbon motor rotates.

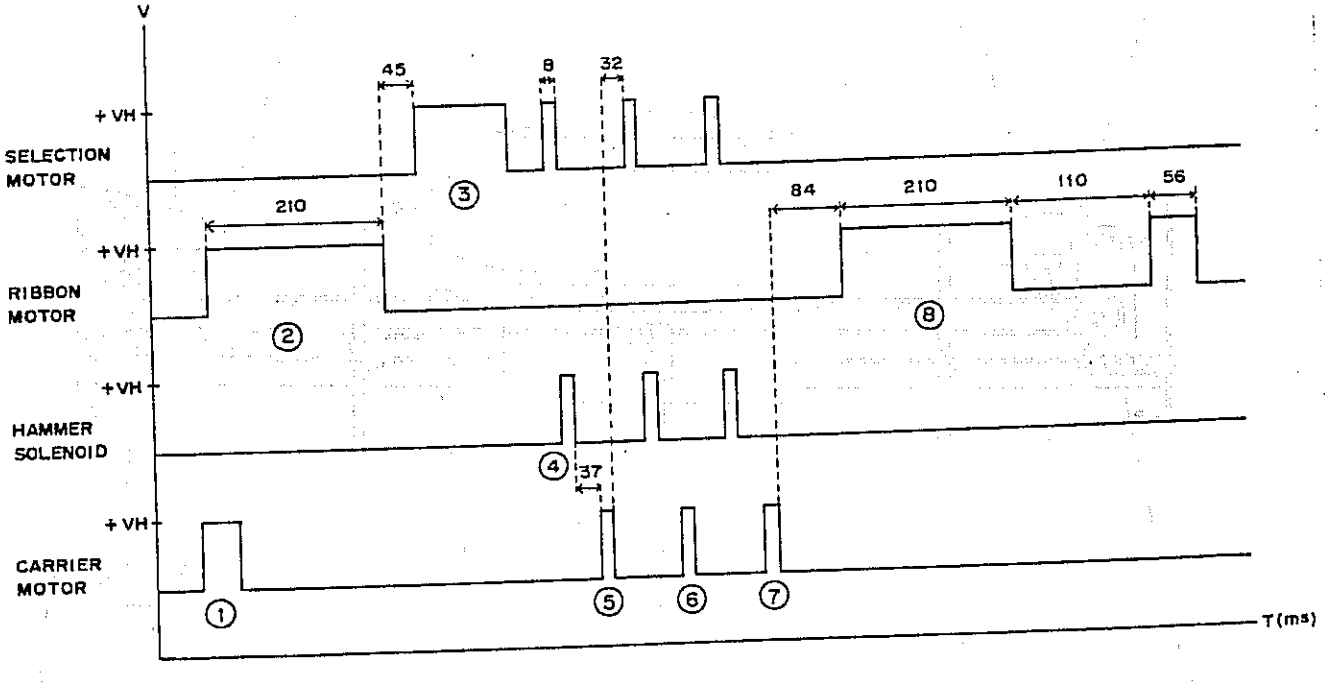
4) After the three motors stop, the hammer solenoid turns on.

5) The above procedure is repeated. After the last character in continuous printing is printed, the carrier rotates 14mesc (if the printing pitch is pica) in the clockwise direction (to the right).



Correction cycle:

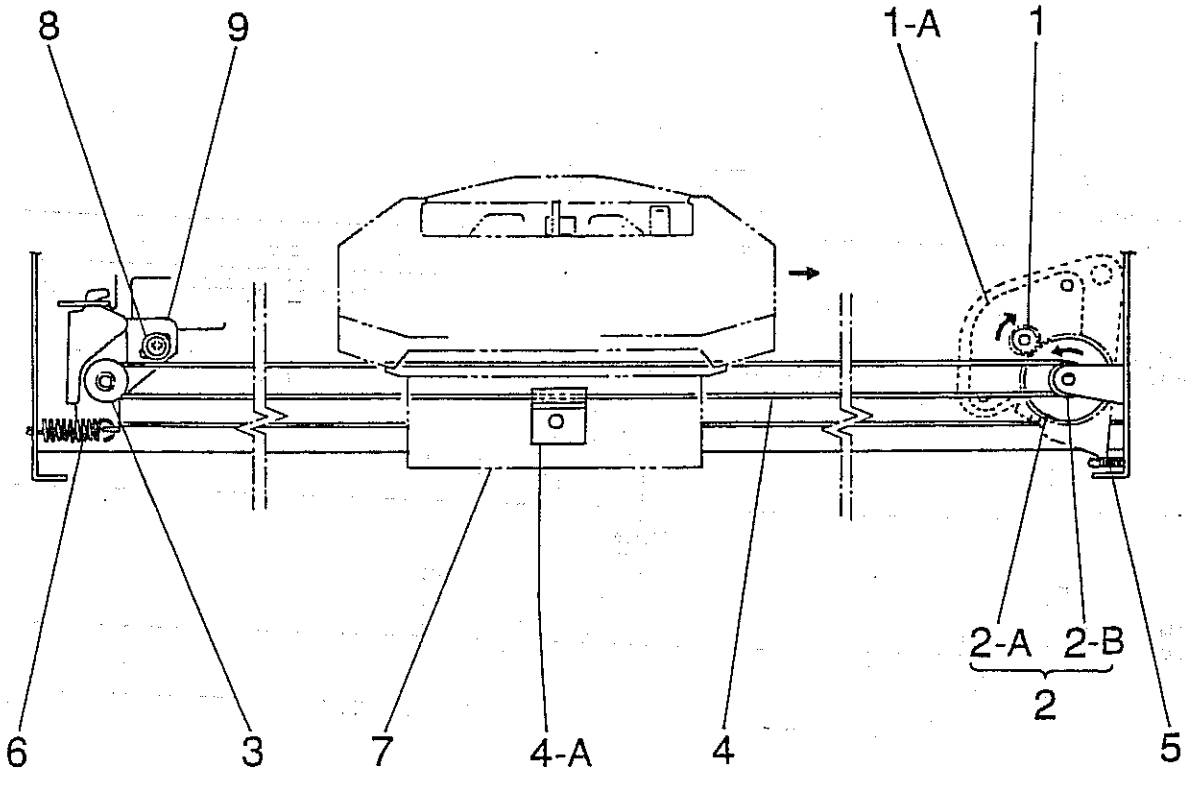
1) When the correction key is pressed, the carrier moves to the character to be corrected.
2) After the carrier motor and ribbon motor stops, the selection motor turns the printwheel to the printing position stored in the correction memory.
3) The ribbon motor turns in the clockwise direction (to the right) and lifts up the correction tape.
4) At the position of the character to be corrected, the hammer solenoid turns on for the first time.
5) The carrier moves 1 step to the left of the first position and then the hammer solenoid turns on for the second time.
6) The carrier moves 1.5 steps to the right of the second position and then the hammer solenoid turns on for the third time.
7) The carrier then moves 0.5 steps to the left of the third position. This position is the same position as in step 4 above.
8) The ribbon motor turns in the clockwise direction (to the right) and lowers the correction tape.



## 3.15 Mechanisms

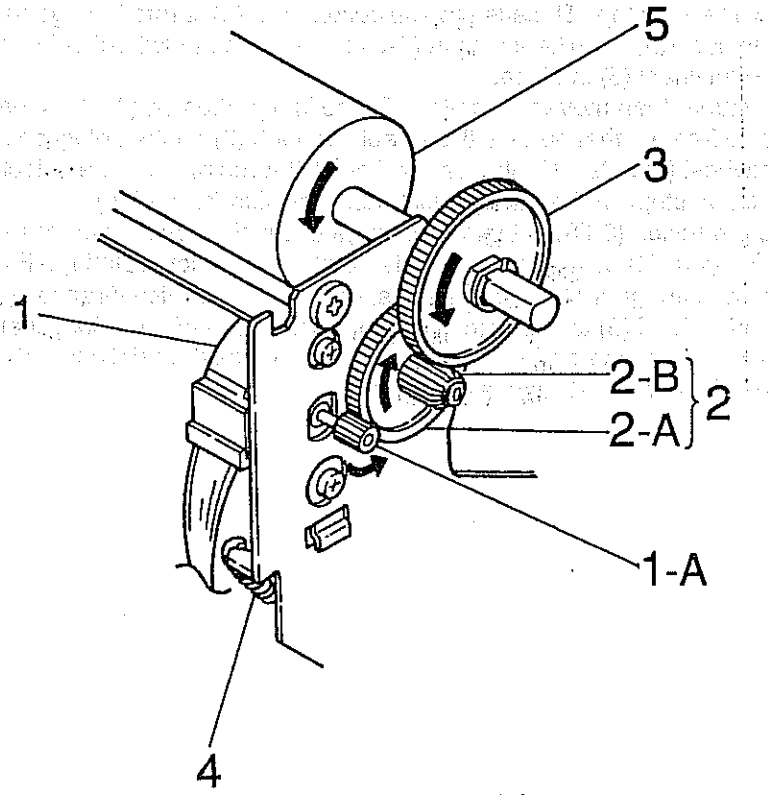
1) Carrier drive mechanism
The carrier drive mechanism consists of the carrier motor (1), the carrier motor gear (1-A), the drive pulleys (2), the idle pulley (3), the drive belt (4), the carrier motor spring (5), and the belt tension spring (6).
A ten-tooth carrier motor gear (1-A) is mounted on the carrier motor (1).
The carrier motor gear (1-A) engages the 64-tooth drive pulley (2-A).
The drive belt (4) engages the 16-tooth drive pulley (2-B).
The carrier (7) is connected to the drive belt (4) by the drive belt holder (4-A).
The carrier motor spring (5) eliminates backlash.
The belt tension spring (6) initially maintains the drive belt (4) tension. Afterwards, it holds the screw (8) and the idle pulley bracket (9) in place. The belt tension is ensured.
When the carrier motor gear (1-A) turns in the clockwise direction (to the right), the drive pulleys (2-A and 2-B) turn in the counterclockwise direction (to the left) and the carrier (7) moves to the right.

Note:
The motor rotation directions referred to in the subsequent explanations of the various mechanisms are stated as when viewed from the output axis side. The "output axis side" is the side of the gear, etc., to which pressure is applied.



2) Line feed drive mechanism

The line feed drive mechanism consists of the line feed motor (1), the line feed motor gear (1-A), the LF middle gear (2), the platen gear (3), and the LF motor spring (4).
The LF middle gear (2) has a 60-tooth gear (2-A) on the outside and a 15-tooth gear (2-B) on the inside. When the 24-step LF motor (1) turns in the counterclockwise direction (to the left), the 10-tooth LF motor gear (1-A) mounted on the LF motor (1) also rotates in the counterclockwise direction.
When the LF motor gear (1-A) rotates in the counterclockwise direction (to the left), the LF middle gear (2) rotates in the clockwise direction (to the right).
When the LF middle gear (2) rotates in the clockwise direction (to the right), the 72-tooth platen gear (3) rotates in the counterclockwise direction (to the left), driving the platen.
The LF motor spring (4) eliminates backlash.



3) Selection motor drive mechanism

The 10-tooth selection motor gear (1-A) is mounted on the 24-step selection motor (1). The 100-tooth two-piece selection gear (3-A) stopped by the selection gear stopper (2) clasps the selection motor gear (1-A) through the compression spring (4).

This arrangement eliminates backlash. The selection gear center pin (3-B) and the front plate push disk (5-A) determine the center (6-A) of the printwheel.

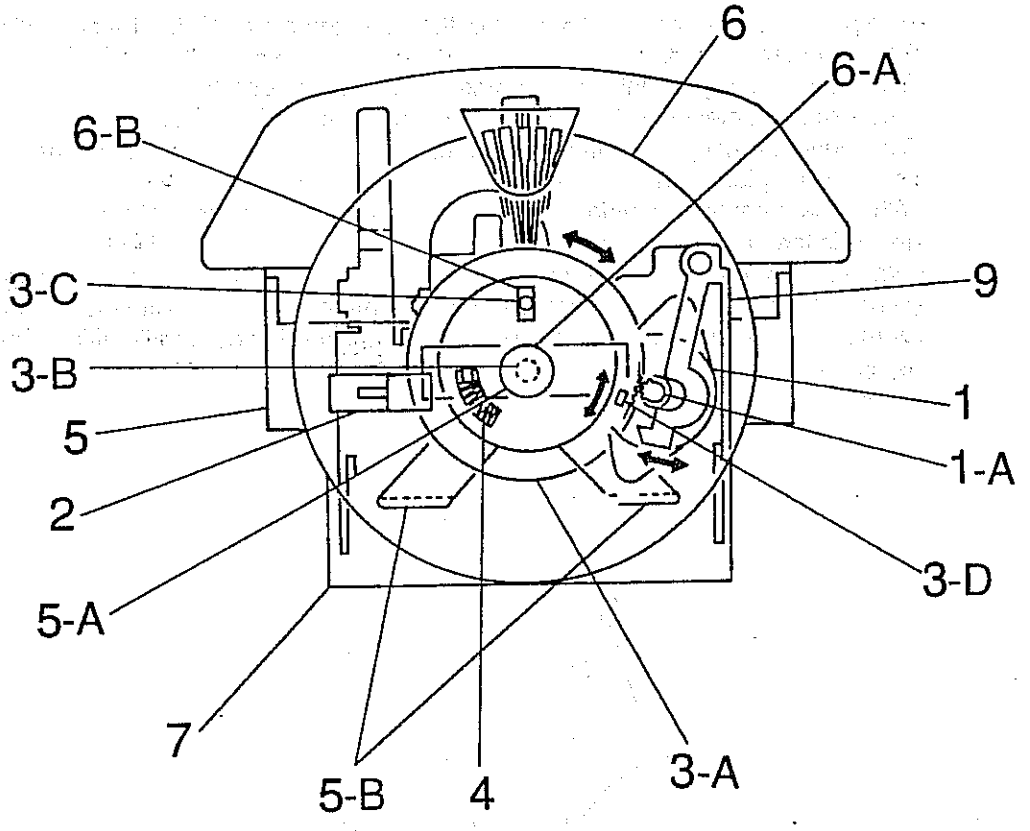
The protrusion (5-B) on the lower part of the front plate stops the rotation of the printwheel (6), turning the wheel set pin (3-C) and latching the guide slot (6-B) on the printwheel. In this way, the printwheel (6) is turned by the rotation of the selection motor (1).

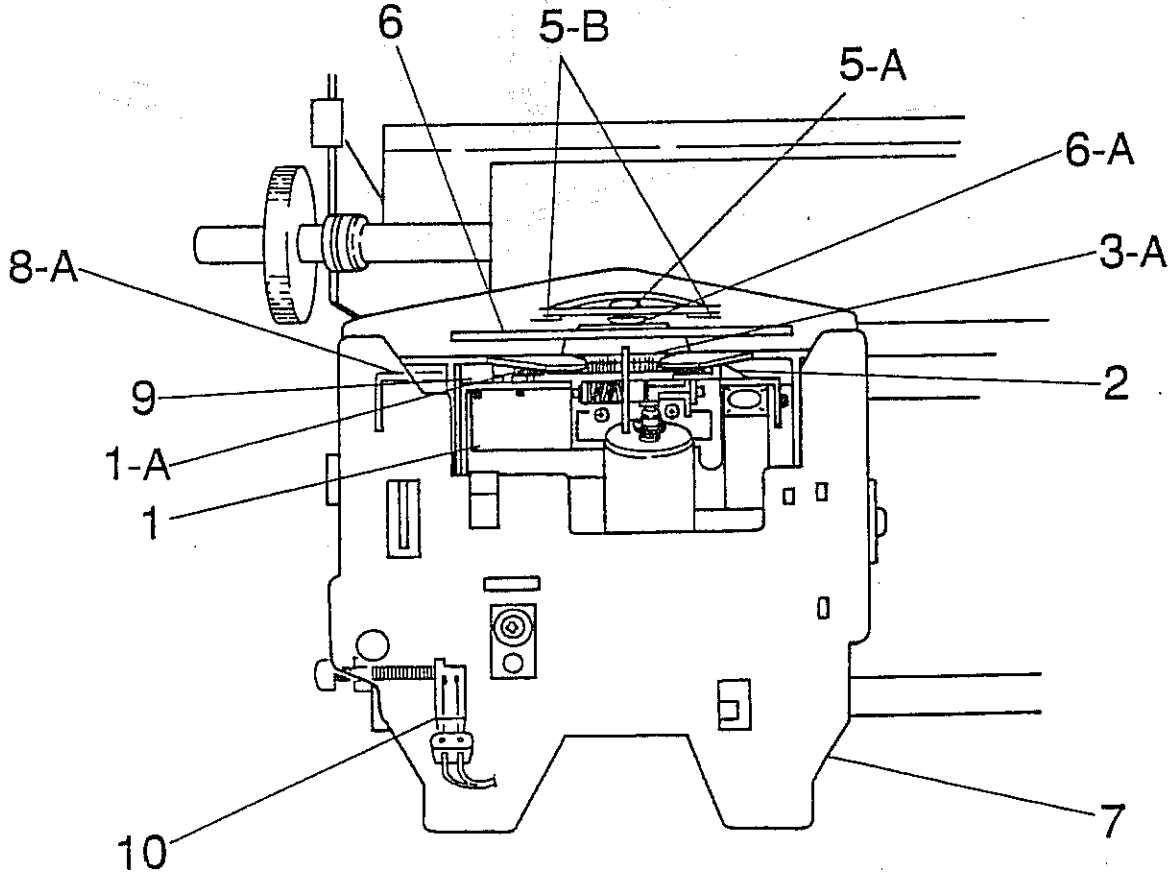
In addition, because the selection gear wheel set pin (3-C) interferes when setting the printwheel (6), raising the possibility of spokes on the printwheel (6) being bent, the program causes the wheel set pin (3-C) to move to the top if there is no key input after printing.

During initialization, if the code key and the "W" key (on the keyboard for the U.S.A.) are pressed, the selection motor rotates 500 steps in the counterclockwise direction (to the left). At this point, the center of the printwheel (6) is determined by the front plate push disk (5-A), with the protrusion (5-B) at the bottom creating resistance that causes the printwheel to stop. Because the selection gear (3) is rotating against the stopped printwheel (6), the wheel set pin (3-C) latches the printwheel guide slot (6-B). This holds the printwheel (6) in place.

The carrier then moves to the left. There is a protrusion (8-A) on the main shaft bracket of side frame L that pushes the wheel set hook (9) on the selection plate on the printwheel (6) side. The left end switch (10) turns on, and the selection motor gear (1-A) turns 208 steps in the counterclockwise direction (to the left).

The protrusion (3-D) on the selection gear is locked by the wheel set hook (9) and the selection gear (3) continues in the "step out" state without rotating. From this state, the selection motor gear (1-A) rotates 16 steps in the clockwise direction (to the right), returning the printwheel (6) to the home position (in the case of the printwheel for the U.S.A., the position where the period (".") is at the top). Once the printwheel (6) is set in the home position, the carrier (7) moves to the right.


6
6-A
6-B
3-C
9
3-B
1
5
1-A
2
3-D
5-A
7
5-B
4
3-A


6
5-B
5-A
6-A
3-A
8-A
9
2
1-A
1
10
7

4) Print head mechanism

The print head mechanism consists of the selection plate (1), the hammer (2), and the hammer solenoid (3).

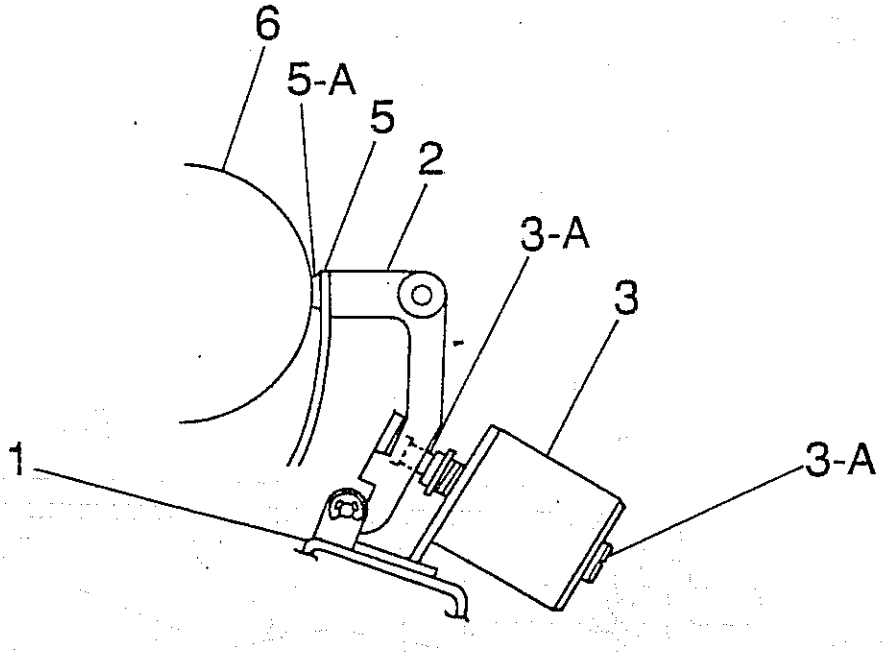
The torsion spring (4) links the hammer (2) to the plunger (3-A).

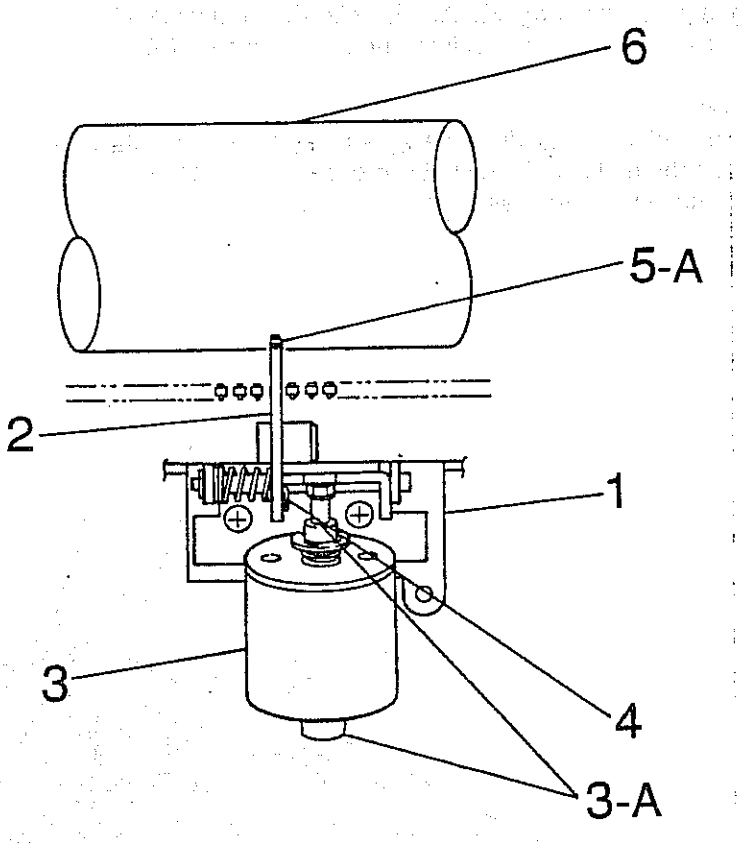
The hammer solenoid is turned on by signals from the CPU (IC201).

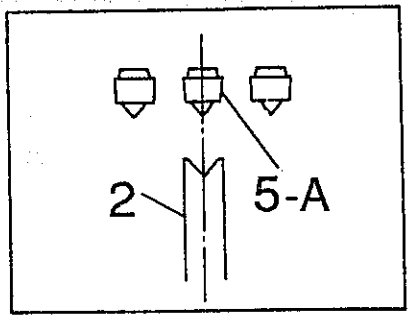
The plunger (3-A) pushes the hammer (2), and the hammer (2) causes the printwheel (5) to strike the platen (6).

When the hammer solenoid (3) is turned off, the torsion spring (4) pulls the hammer back towards the hammer solenoid (3).

When the character (5-A) on the printwheel to be printed reaches the printing position, the center line of the character on the printwheel must be lined up with the center line of the hammer (2). If the center lines are even slightly misaligned, the resulting printing will not be crisp.



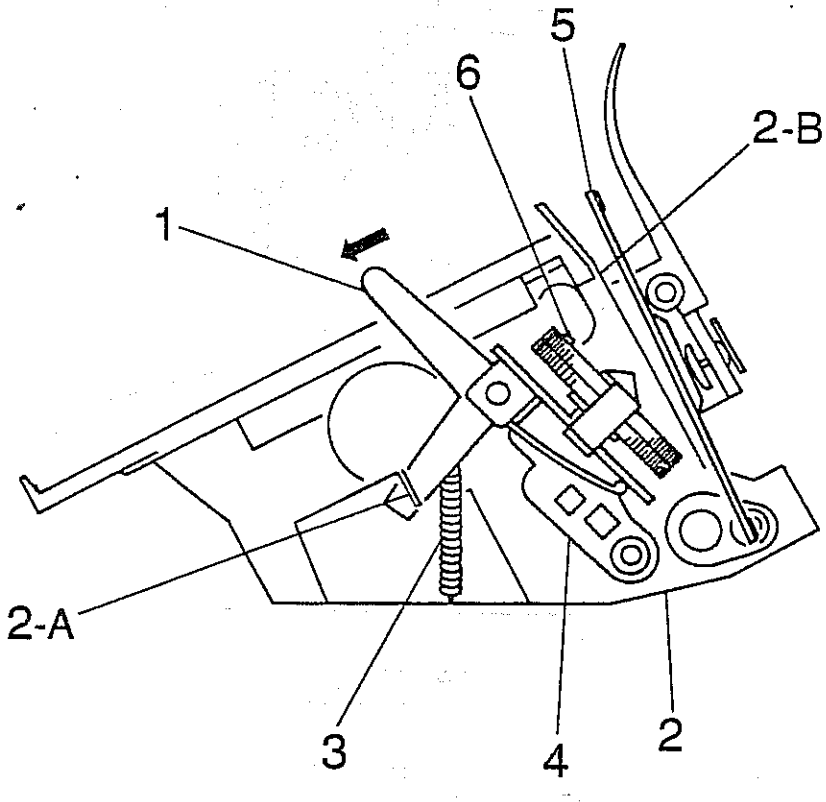

6
5-A
2
1
3
4
3-A


2
5-A

5) Printwheel release/setting mechanism

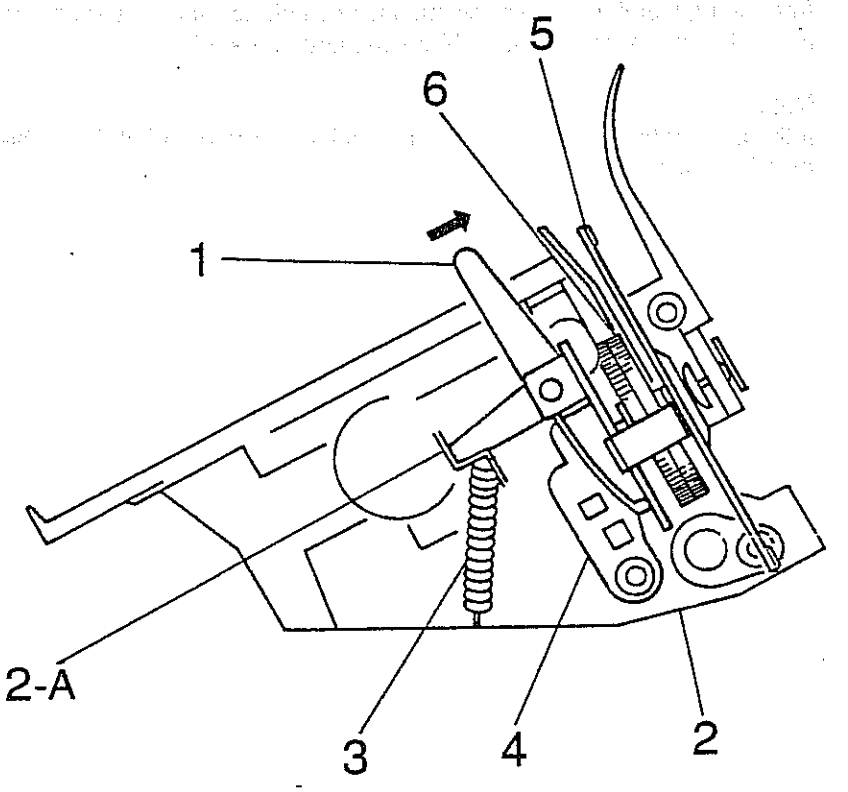
Printwheel release mechanism:
When the wheel release lever (1) is pulled forward, the wheel release lever (1) moves away from the carrier box stopper (2-A) and the selection plate (4) is tilted forward by the wheel release spring (3). At this point the printwheel (5) strikes a portion of the carrier box (2-B) and is released from the selection gear (6).

Note:
Do not release the printwheel when the carrier is in contact with the side frame L, because the main shaft bracket is pressing against the wheel set hook, which could damage the printwheel if excessive force is applied.



Printwheel setting mechanism:
Drop the printwheel (5) in front of the front plate.
When the wheel release lever (1) is pressed against the platen side, the selection plate (4) rises up. The wheel release lever (1) is locked against the carrier box stopper (2-A) and the selection gear (6) is ready so that the printwheel (5) can be set.

Note:
Do not set the printwheel when the carrier is in contact with the side frame L, because the main shaft bracket is pressing against the wheel set hook, which could damage the printwheel if excessive force is applied.



6) Ribbon feed mechanism

The ribbon motor (1) is a 24-step stepping motor. The amount of ribbon (2-A) that is taken up depends on the number of characters and on the ribbon cassette. The ribbon motor is also used for lifting and feeding the correction tape.

The 12-tooth ribbon motor gear (1-A) is mounted on the ribbon motor shaft and engages the 76-tooth ribbon drive gear (3).

When the ribbon motor gear (1-A) rotates in the counterclockwise direction (to the left), the ribbon drive gear (3) rotates in the clockwise direction (to the right).

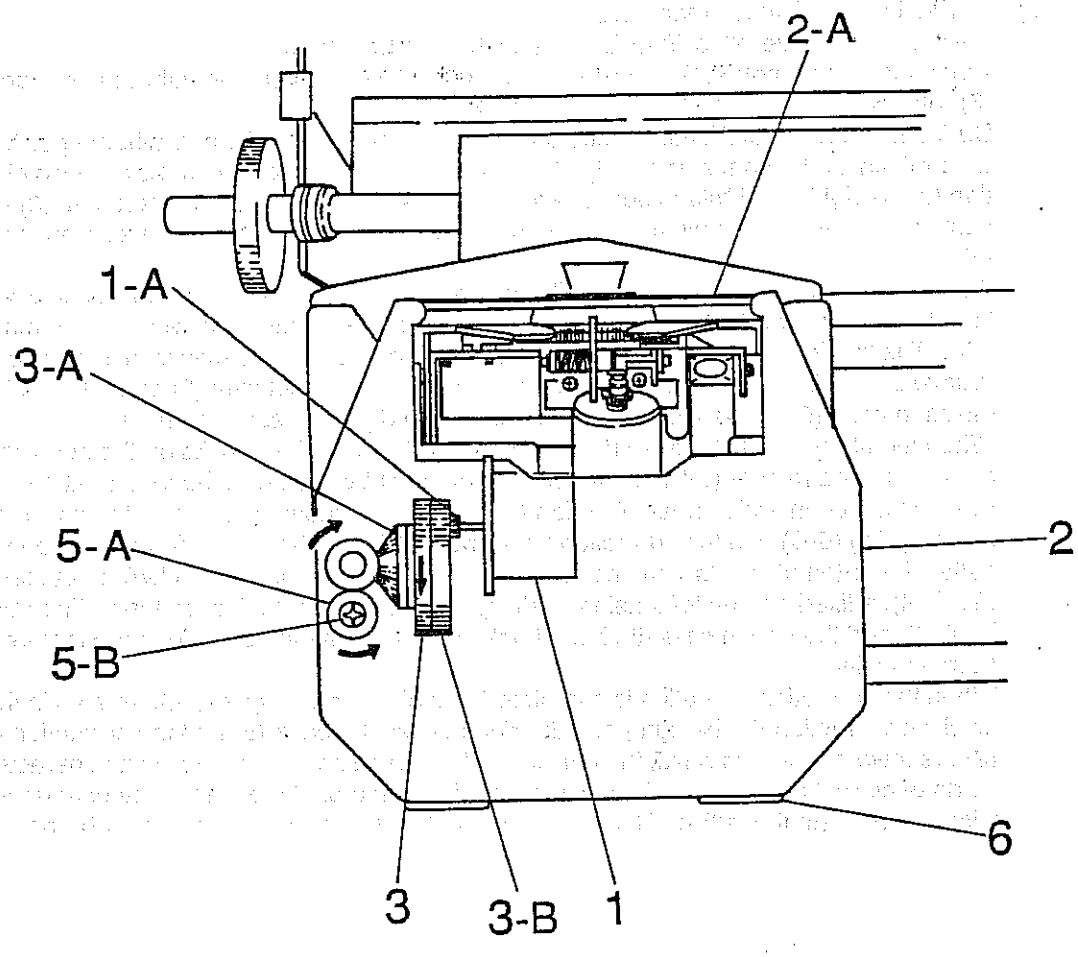
The drive bevel gear (3-A) on the ribbon drive gear also rotates in the clockwise direction (to the right), and the ribbon bevel gear (4) rotates in the clockwise direction (to the right).

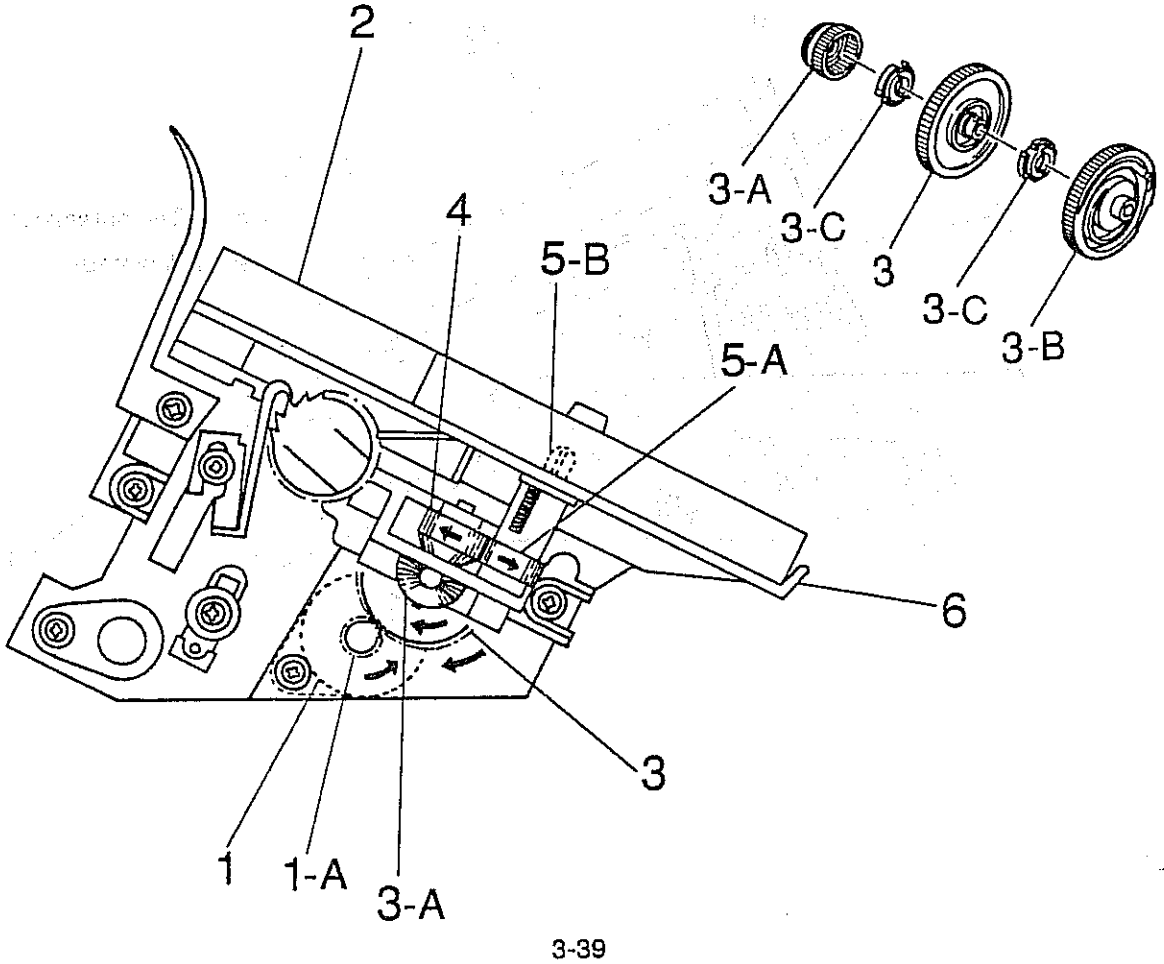
The ribbon gear (5-A) and the ribbon feed pole (5-B) rotate in the counterclockwise direction (to the left), causing the ribbon in the ribbon cassette (2) to be wound up.

Although the correct cam (3-B) is on the ribbon drive gear, even if the ribbon motor gear (1) and the correct cam (3-B) were to rotate in the clockwise direction (to the right), the drive ratchets (3-C) on both sides of the ribbon drive gear (3) would prevent the ribbon from being wound up. In addition, it is possible to wind up the ribbon even with the ribbon cassette (2) mounted on the ribbon cassette base (6).

Note:

If the drive ratchets (3-C) are mounted with the wrong orientation, the mechanism will not function correctly.


2-A
1-A
3-A
5-A
5-B
2
6
3
3-B
1


2
4
5-B
5-A
6
3
1
1-A
3-A
3-A
3-C
3
3-C
3-B

7) Correction tape lift/feed mechanism

The correction tape (2) is lifted and fed by the ribbon motor (1).

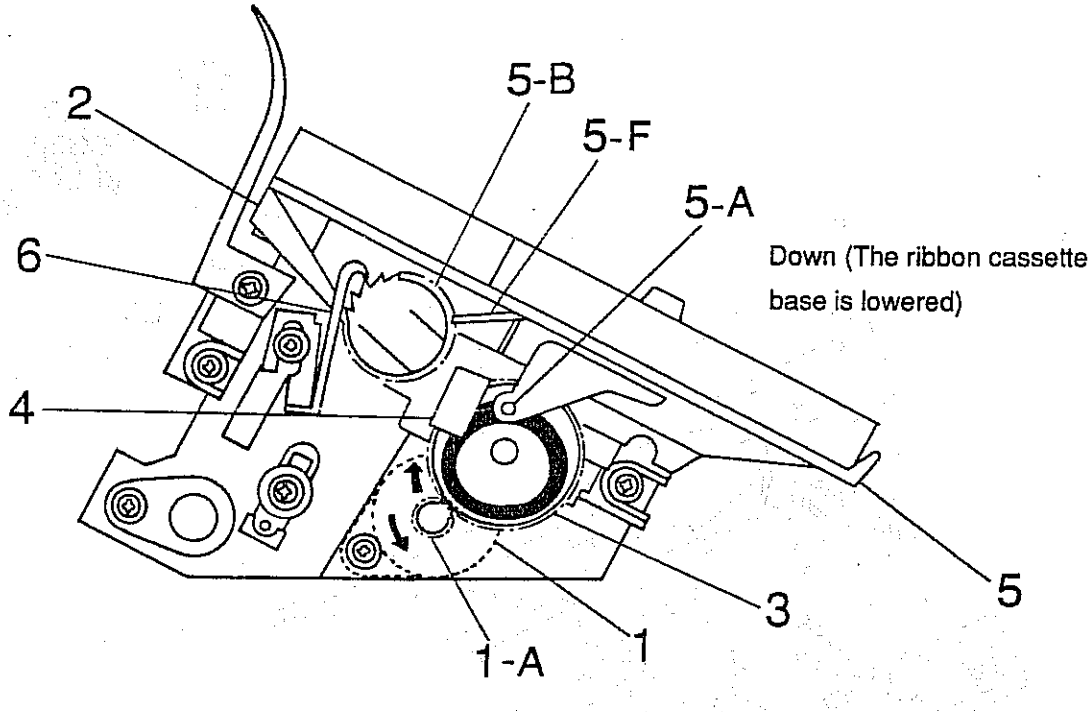
When the ribbon motor (1) rotates in the clockwise direction (to the right), the correct cam (3) rotates, lifting and feeding the correction tape (2).

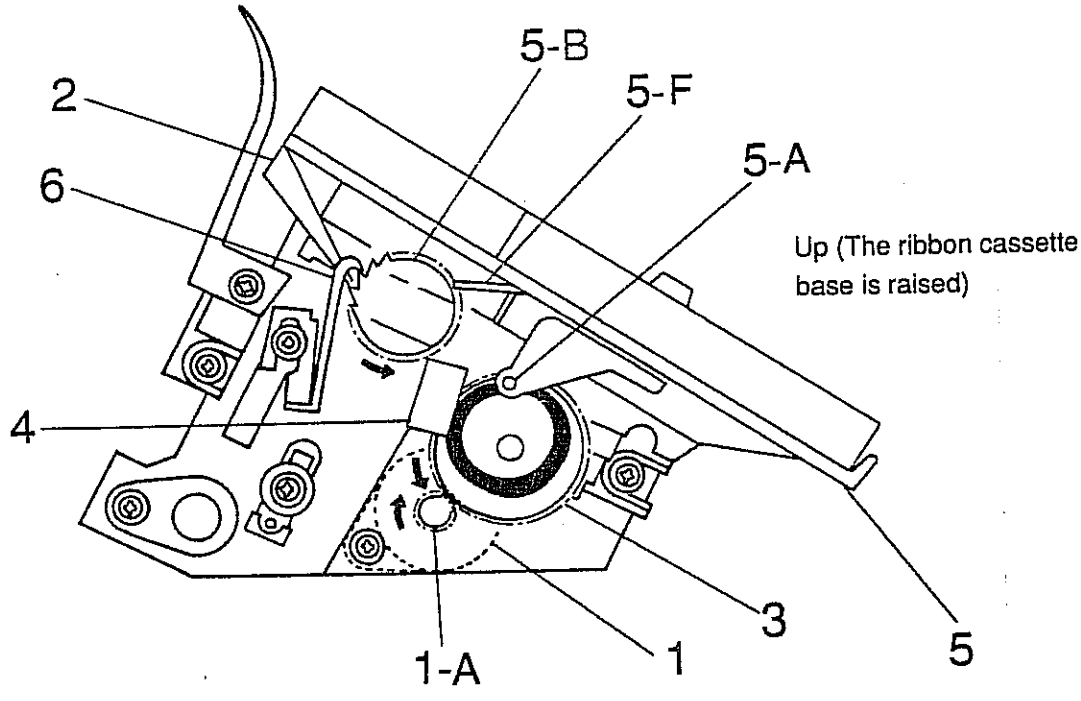
During the initial operations, the custom cam (3) is set to a position (the home position) determined by the cam stopper (4). (The correct cam (3) rotates in the clockwise direction (to the right), and "steps out" due to the cam stopper (4).) The correct cam (3) has a cam groove, and the lift pin (5-A) of the ribbon cassette base moves in accordance with this groove.

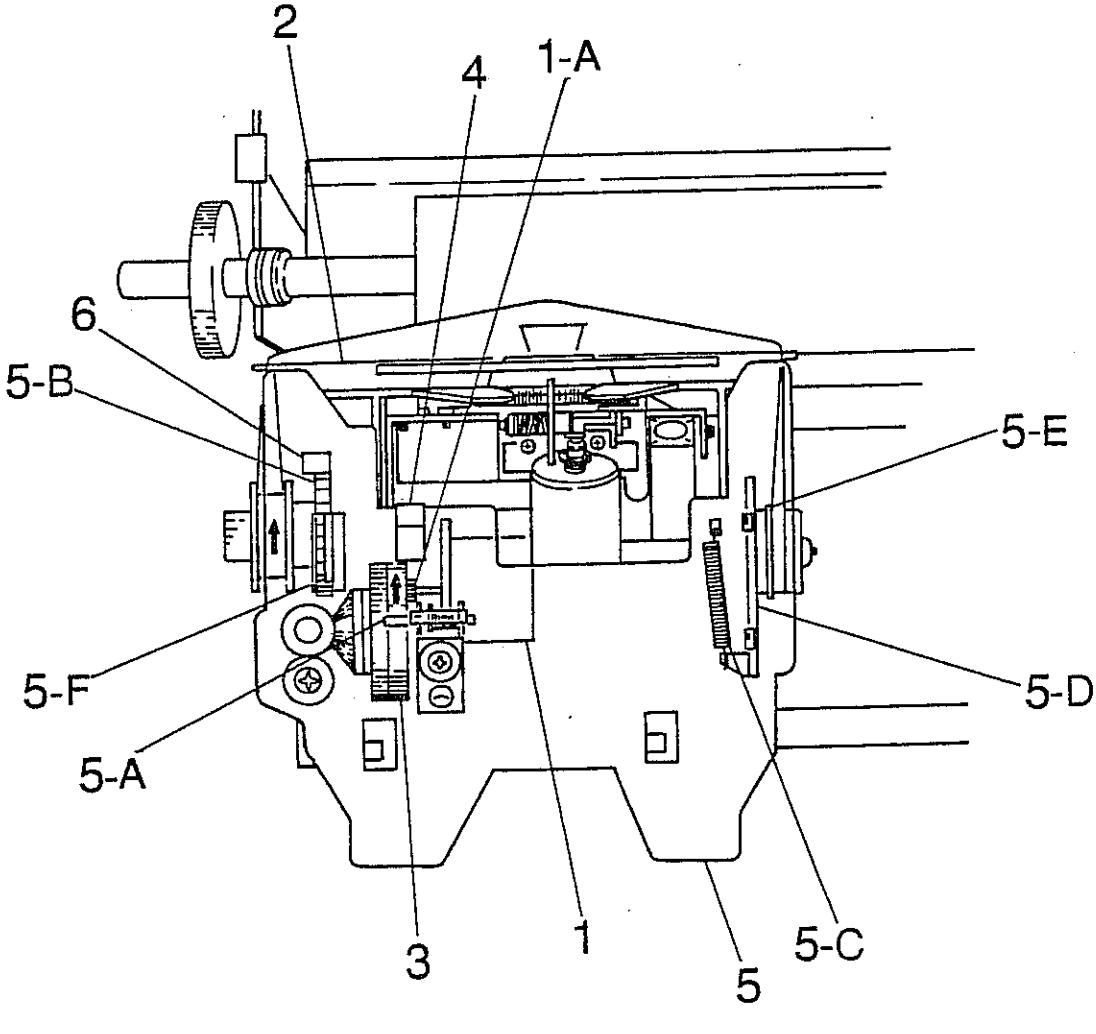
If the correction key is pressed, the ribbon motor gear (1-A) rotates in the clockwise direction (to the right), and the correct cam (3) rotates in the counterclockwise direction (to the left). The lift pin (5-A) on the bottom of the ribbon cassette base moves inside the cam groove of the correct cam (3). The construction of the correct cam (3) causes the ribbon cassette base (5) to rise, lifting the correction tape (2) in the same manner.

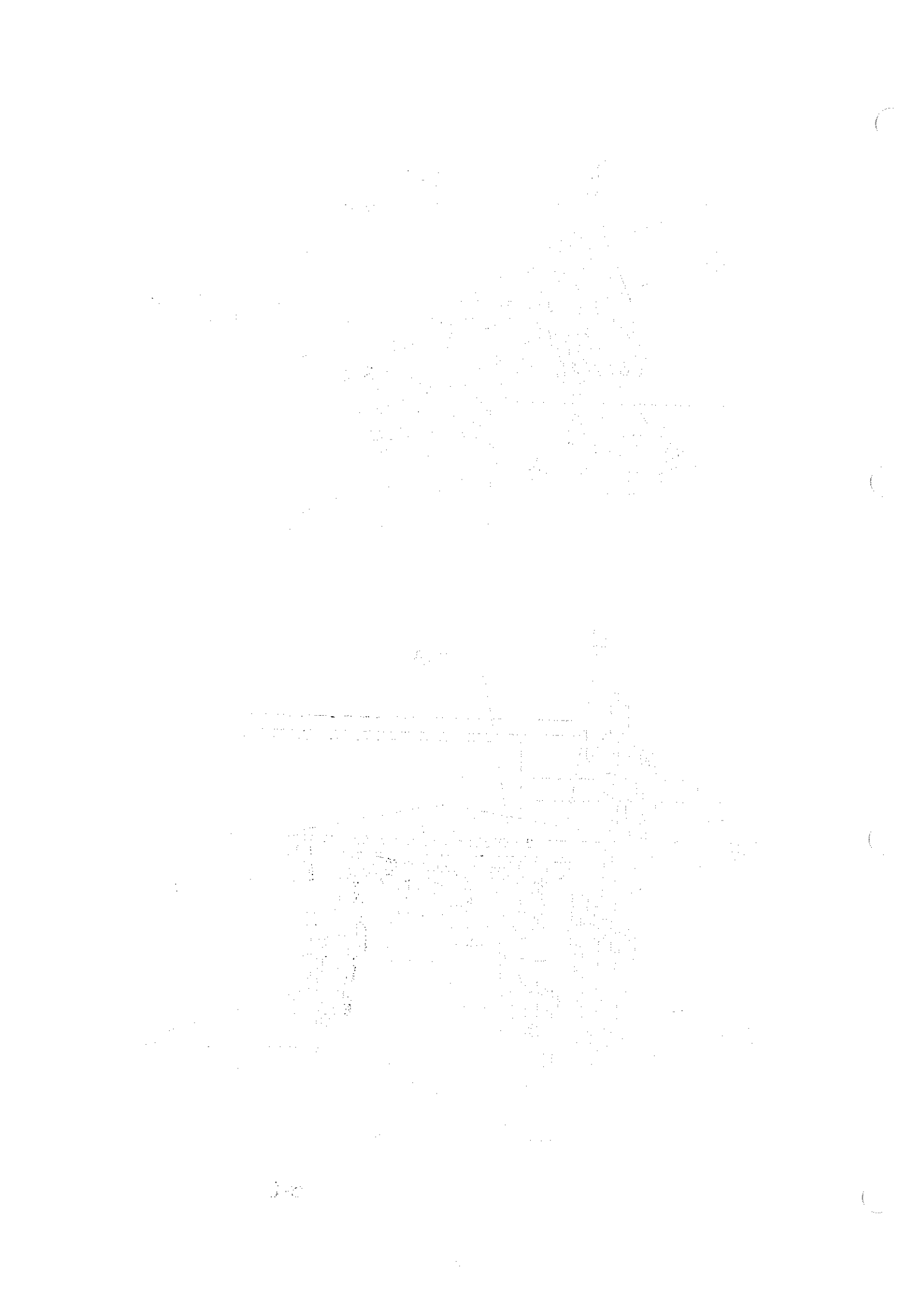
When the ribbon cassette base (5) is lifted, the ratchet hook (6) locks on the hook of the correction feed ratchet (5-B) on the left side of the ribbon cassette base, and attempts to rotate in the counterclockwise direction (to the left). In addition, because the correction brake spring (5-C) and the correction brake rack (5-D) on the right side of the ribbon cassette base attempt to rotate the correction tape holder (5-E) in the clockwise direction (to the right), a fixed amount of tension is always applied to the correction tape. The ratchet hook (6) and the ribbon cassette base hook (5-F) prevent the correction feed ratchet (5-B) from reversing.

When the correction operation is completed, the ribbon motor gear (1-A) rotates in the clockwise direction (to the right) and the ribbon cassette base (5) and the correction tape (2) are lowered. At this point, the correction feed ratchet (5-B) takes up one character's worth of correction tape (2). Afterwards, the ribbon motor (1) rotates in the counterclockwise direction (to the left) and the correct cam (3) is set to the cam stopper (4) position.




5-B
5-F
2
5-A
6
Up (The ribbon cassette base is raised)
4
3
5
1-A
1


2
4
1-A
6
5-B
5-E
5-F
5-D
5-A
3
1
5-C
5



# 4. Adjustment and Measurements

## 4.1 General Adjustment Procedure

Unless specifically stated otherwise (unless not using adjustment mode), always turn the power switch off and unplug the unit before making adjustments.

## 4.2 Self Printing Test

This typewriter is equipped with a self printing test function.
This function prints all of the characters and performs a line feed and return.

Self printing test method:

1) Turn the power switch off.

2) While holding down the margin release key, turn the power switch on.
(Once the carrier begins moving, release the margin release key.)

3) After the initial operations are completed, the self printing test begins.

4) The self printing test is terminated by turning the power switch off.

Performing the self printing test while checking the LCD display for missing cells:

1) Turn the power switch off.

2) While holding down the margin release key and the tab key, turn the power switch on.
(Once the carrier begins moving, release the margin release key and the tab key.)

3) After the initial operations are completed, the self printing test begins. The LCD display turns black. Any cells that do not turn black indicate a malfunction for that particular cell. If this happens, replace the entire LCD.

4) The self printing test is terminated by turning the power switch off.

Note:
Printing is performed with the preprogrammed pitch and line spacing.
If the self printing function is used, the current settings for margins, tabs, pitch, line spacing, and impression are all cleared and the factory settings are restored.

## 4.3 Setting Adjustment Mode

Adjustment mode is used to adjust the carrier and selection home positions and to adjust the carrier and platen positions.

Entering adjustment mode:

1) Hold down the code key and the margin release key and turn the power switch on.

2) Release the keys. The typewriter is now in adjustment mode.

3) Adjustment mode can be terminated by turning the power switch off.

### 4.3.1 Carrier Home Position Adjustment Mode

1) Confirm that the typewriter is in adjustment mode.

2) The left end of the rail slide can be moved closer to the mark on the front guide rail.
   Each time the relocation key is pressed, the carrier moves one step to the left.
   Each time the mode key is pressed, the carrier moves one step to the right.
   Each time the back space key is pressed, the carrier moves two steps to the left.
   Each time the space bar is pressed, the carrier moves two steps to the right.

3) Press the express key to activate the carrier motor.

4) The carrier home position can be confirmed by pressing the return key.
   If the carrier home position is not set correctly, the typewriter will beep.

### 4.3.2 Selection Motor Home Position and Hammer Position Adjustment Mode

1) Confirm that the typewriter is in adjustment mode.

2) While holding down the code key, press the express key to activate the selection motor.
   (Do not turn the motor on for more than a minute, as doing so places a strain on the PCB.)

3) The position of the hammer and the printwheel spokes can be checked using the characters to the left and the right.
   Pressing the index key causes the selection motor to turn clockwise (to the right) one character.
   Pressing the reverse index key causes the selection motor to turn counterclockwise (to the left) one character.

### 4.3.3 Carrier and Platen Position Adjustment Mode

1) Confirm that the typewriter is in adjustment mode.

2) The printing impression can be lowered in order to determine the positional relationship between the carrier and platen.
   Press the margin left/right key to reduce the printing impression.
   Press the tab set/clear key to increase the printing impression.
   Press the margin release key to return the printing impression to the original level.
   When this mode is left, the printing impression returns to the factory (initial) setting.

## 4.4 Adjustment Procedure

### 4.4.1 Carrier Home Position Adjustment

Check: While in adjustment mode, press the return key and make sure that the beeper does not sound when the typewriter checks the carrier home position.

Adjustment:

1) After turning the power switch off, move the left edge of the rail slide (1) close to the right marking on the front guide rail markings (2-A).

2) Enter adjustment mode. (Refer to section 4.3.1, "Carrier Home Position Adjustment Mode.")

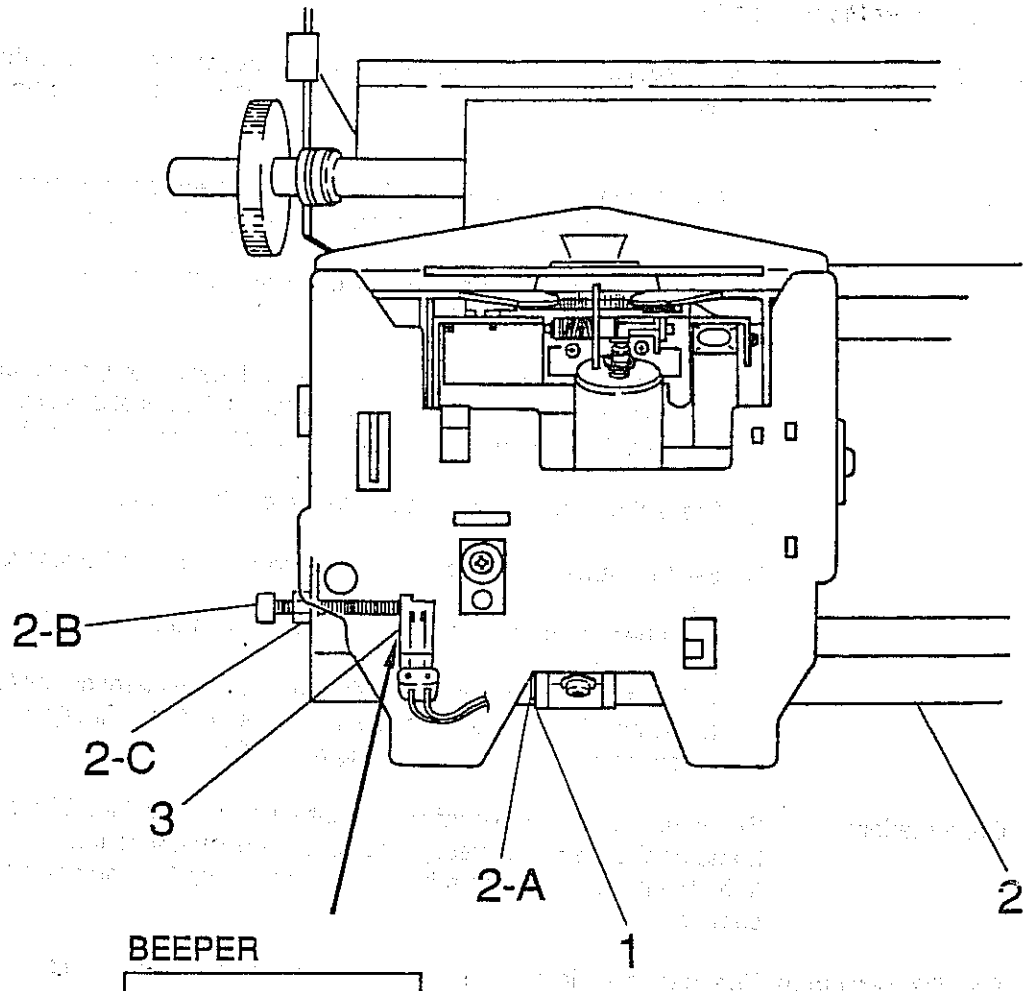
3) Press the space bar, back space key, relocation key, and mode key to move the carrier so that the left edge of the rail slide (1) is as close as possible to the right marking on the front guide rail markings (2-A).

4) Press the express key to activate the carrier motor.

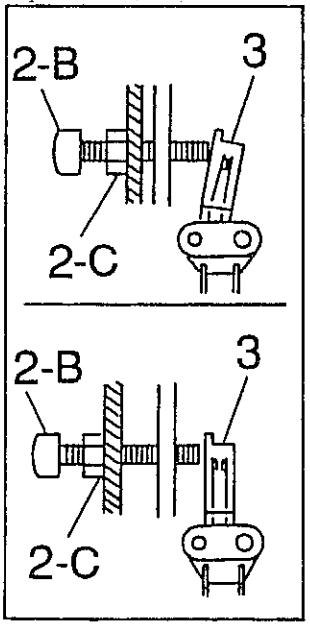
5) Set the carrier to the position just before the left end switch is turned off:
If the beeper is sounding, loosen the adjustment screw (2-B) until the beeper stops.
If the beeper is not sounding, tighten the adjustment screw (2-B) up to the position where the beeper starts sounding. Finally, fix the screw's position with the locking nut (2-C).

Confirmation: Press the return key to confirm the carrier home position. The carrier home position is set correctly if the beeper does not sound.
If the beeper sounds intermittently, return to step 3 of the adjustment procedure.

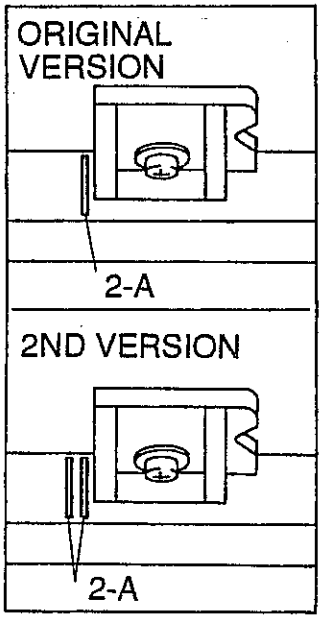
Possible symptoms: The margin scale and the starting printing position do not match.




BEEPER




MARKING



### 4.4.2 Selection Motor Home Position Adjustment

Check: When the selection motor is activated, the center line of the hammer and the center line of the wheel set pin must be lined up.

Adjustment:

1) Loosen the two screws (1) and then hand-tighten the selection motor screws so that the top one is at the right end of the upper oval (2-A) and the bottom one is at the left end of the lower oval (2-B).

2) Enter adjustment mode.
While holding down the code key, press the express key to activate the selection motor. (Refer to section 4.3.2, "Selection Motor Home Position and Hammer Position Adjustment Mode.")

3) Line up the two round selection gear holes (3-A and 3-B), and then with those holes lined up with the square hole (4-A) in the selection plate, slide the gears onto the selection plate shaft (4-B) and engage them with the selection motor gear (4-C). Finally, fix the selection gears (3) in place with the selection gear stopper.

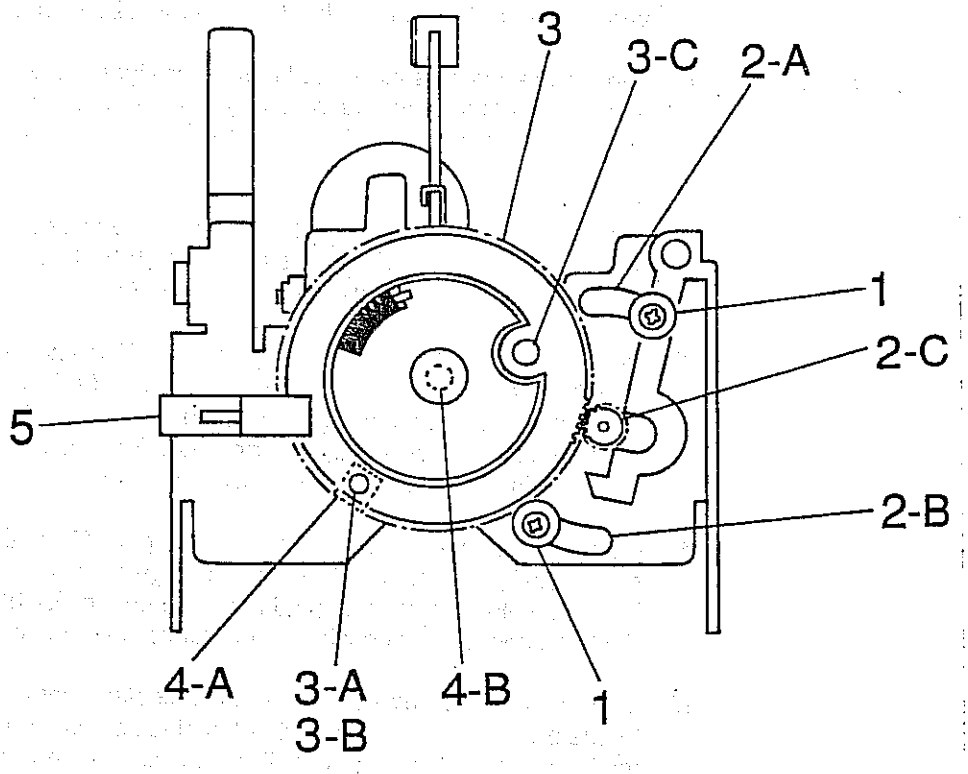
4) Mount the printwheel (6) on the selection gear (3) so that the wheel set pin (3-C) latches onto the printwheel guide slot.
Turn the selection gear (3) so that the center line of the wheel set pin (3-C) is directly lined up with the center of the hammer "V" notch (7).

5) Loosen the two screws (1), move the selection motor (2) as indicated by the arrow and fix the printwheel in place so that the period (".") (on the keyboard for the U.S.A.) is lined up with the center of the "V" notch.
Press the index key and the reverse index key to check the spokes to the left and right on the printwheel (6).
If the printwheel cannot be fixed in place in a position where it moves the same amount to the left and the right (one character = two steps), return to step 3 and re-assemble the assembly.

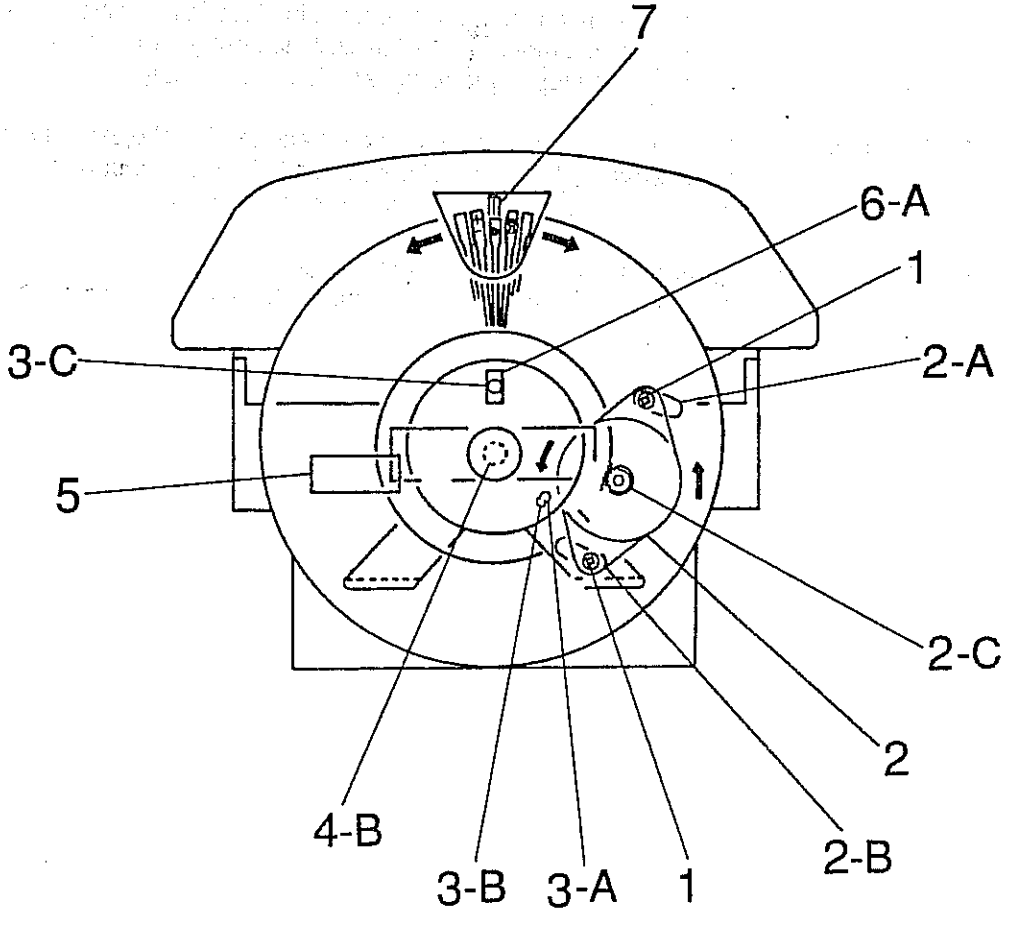
Confirmation: After the power has been turned on and the initial operations have been completed, make sure that the period (".") on the printwheel (for the keyboard for the U.S.A.) comes to the center position.

Possible symptoms: "||" or an incorrect character is printed.
This can cause the printwheel spokes to be bent or damaged.

Positioning for hand-tightening the selection motor and positioning for inserting the selection gears onto the selection gear shaft




Printwheel, hammer, and selection gear adjustment position



### 4.4.3 Hammer Position Adjustment

Check: The center line of the hammer and the center line of the spoke (printwheel) must match.

Adjustment:

1) Enter adjustment mode.
While holding down the code key, press the express key to activate the selection motor. (Refer to section 4.3.2, "Selection Motor Home Position and Hammer Position Adjustment Mode.")

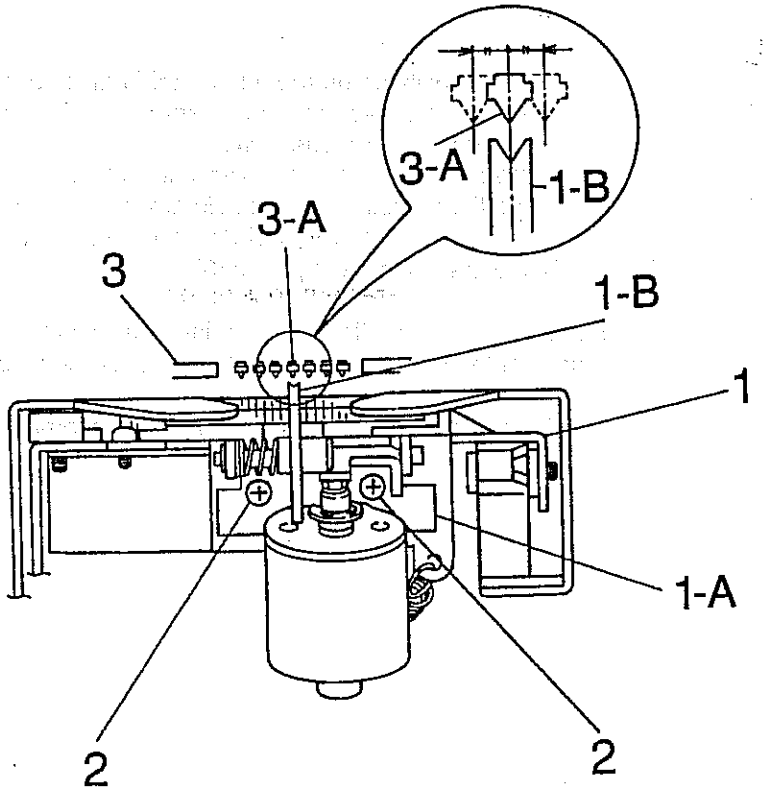
2) Loosen the two screws (2) holding the hammer bracket (1-A) in place.

3) Slide the hammer bracket (1-A) left or right so that the center line of the hammer (1-B) is lined up with the center line of the spoke (printwheel) (3-A).

Note:
Fix the hammer (1-B) in a position so that if you gently move the spoke (printwheel) (3-A) with your finger, the spoke moves the same amount to the left and right.

Confirmation: Move the selection motor one character (two steps) at a time (refer to section 4.3.2, "Selection Motor Home Position and Hammer Position Adjustment Mode") and make sure that the center line of each spoke on the printwheel (3-A) matches the center line of the hammer (1-B).

Possible Symptom: "||" or an incorrect character is printed.
This can cause the printwheel spokes to be bent or damaged.



### 4.4.4 Carrier and Platen Position Adjustment

Check: There must be no missing parts of characters when printing, and the intensity of the top and bottom halves of printed characters must be equal.

Adjustment:

1) Enter adjustment mode. (Refer to section 4.3.3, "Carrier and Platen Position Adjustment Mode.") (Adjust the printing impression so that characters are printed faintly on the paper (so that they can be checked).)

2) Print vertical lines and underlines (or any characters with width or height.)

3) Insert a flathead screwdriver into the rail slide hole (1-A) and adjust the rail slide (2) position so that there are no missing parts of characters and so that the top and bottom halves of the characters are printed with even intensity.
**If the top halves of characters are faint:**
Move the rail slide (2) up.
**If the bottom halves of characters are faint:**
Move the rail slide (2) down.

4) Confirm that all characters are printed and that the intensity of the top and bottom halves of the characters is even.

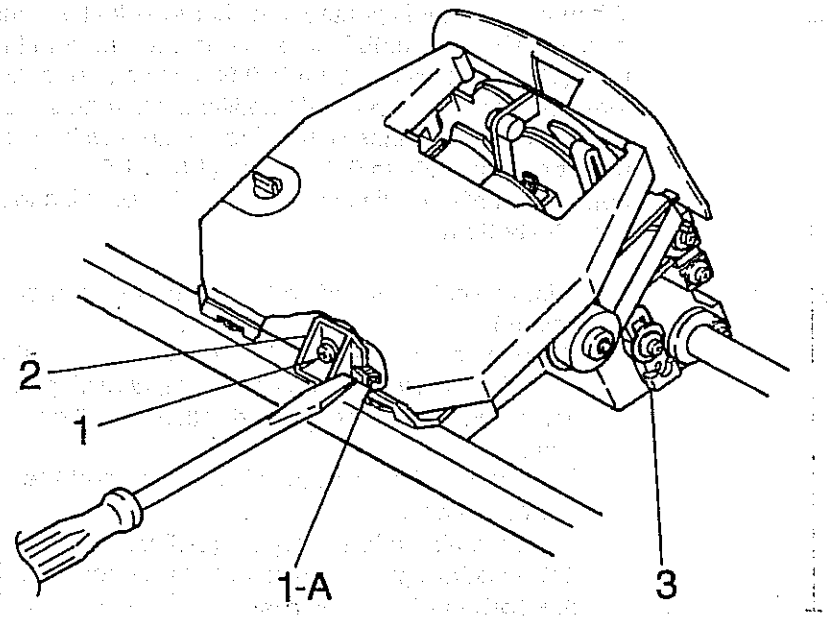
5) Turn the power switch off and leave adjustment mode.
The printing impression is returned to the factory (initial) setting.
If the printing impression is not appropriate, change the short pin connection for SW202 on the control PCB. The printing impression can be changed through the software.

| Short pin | Open SP01 SP02 SP03 SP04 |
|---|---|
| Printing impression | Weak ← Standard → Strong |

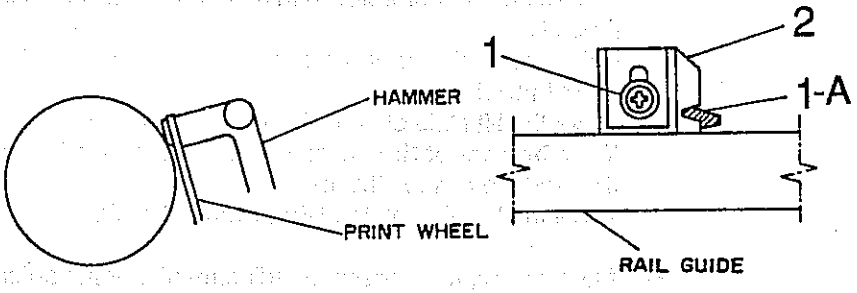
Note:
If the intensity of the top and bottom halves of characters can not be made even, move the adjustment plates (3) located on the left and right sides of the carrier box.
**If the top halves of characters are faint:**
Move the adjustment plates (3) down.
**If the bottom halves of characters are faint:**
Move the adjustment plates (3) up.

Confirmation: Perform the self printing test or print vertical lines and confirm that the intensity of the top and bottom halves of characters is even.

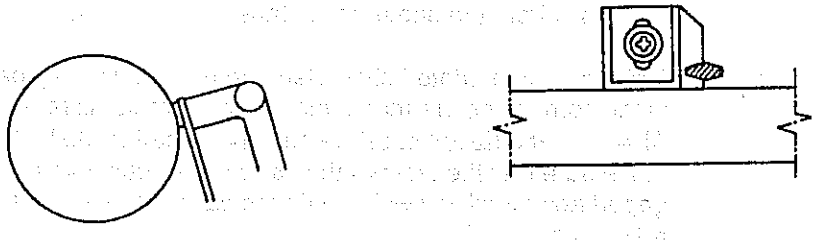
Possible symptoms: Missing parts of characters, loss of detail, incomplete correction.



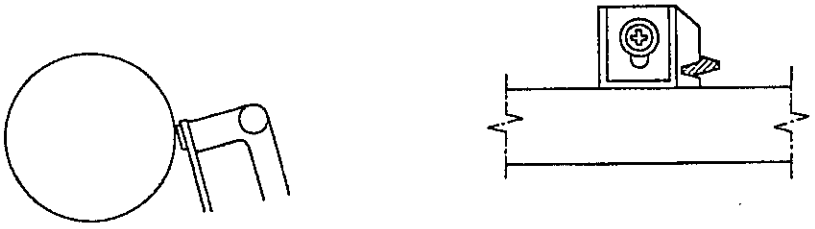

The bottom half of the character strikes the platen first, and the top half of the character is faint or missing.




The character strikes the platen squarely, and prints correctly.



The top half of the character strikes the platen first, and the bottom half of the character is faint or missing.



### 4.4.5 Correction Tape Lift and Ribbon Tape Position Adjustment

Check: When a character is printed, the character that is transferred must leave a space of 0.03 to 0.05 inches (0.8 to 1.2mm) from the top of the ribbon tape (1) and a space of 0.04 to 0.08 inches (1.0 to 2.0mm) from the bottom of the ribbon tape (1). In addition, when a correction is made, the top part of vertical lines lifted off (corrected) with the correction tape (2) must be within 0.04 to 0.06 inches (1.0 to 1.5mm) from the top and the bottom part of underlines must be 0.06 to 0.08 inches (1.5 to 2.0mm) from the bottom.

Adjustment:

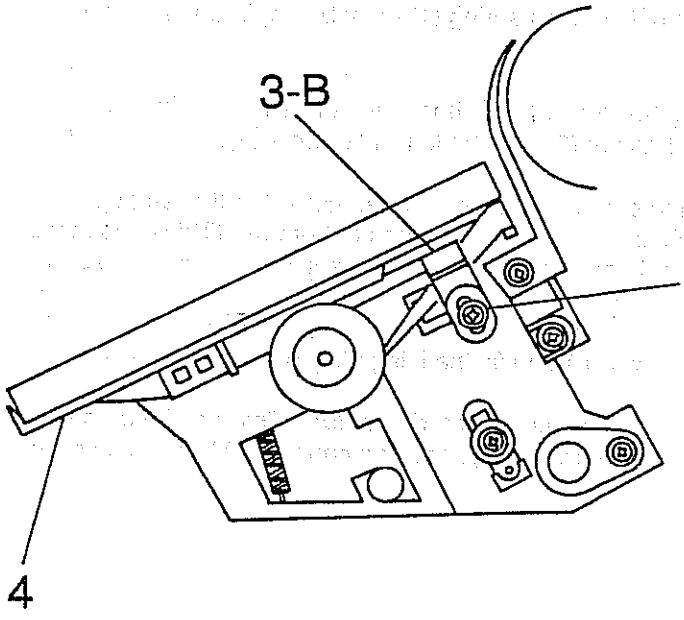
1) Print vertical lines and underlines (or any characters with width or height.)
   Move the screw (3-A) holding the ribbon base stopper on the right side of the carrier box up and down, adjusting the position so that printed characters are printed within the range specified for ribbon tape.
   **If the top of the character is missing and there is no space at the top of the ribbon:**
   Move the ribbon base stopper (3-B) up.
   **If the bottom of the character is missing and there is no space at the bottom of the ribbon:**
   Move the ribbon base stopper (3-B) down.

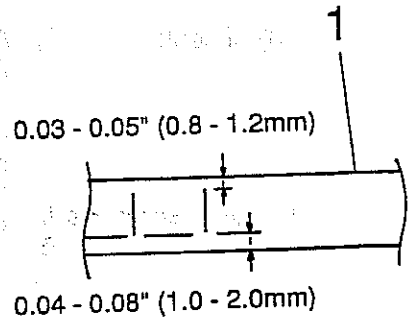
2) Move the screw (4-A) holding the lift slide plate on the ribbon cassette base back and forth, adjusting the position so that corrected characters are corrected within the range specified for correction tape (2).
   **If the top of the character is missing and there is no space at the top of the ribbon:**
   Move the lift slide plate (4-B) towards you.
   **If the bottom of the character is missing and there is no space at the bottom of the ribbon:**
   Move the lift slide plate (4-B) towards the platen.

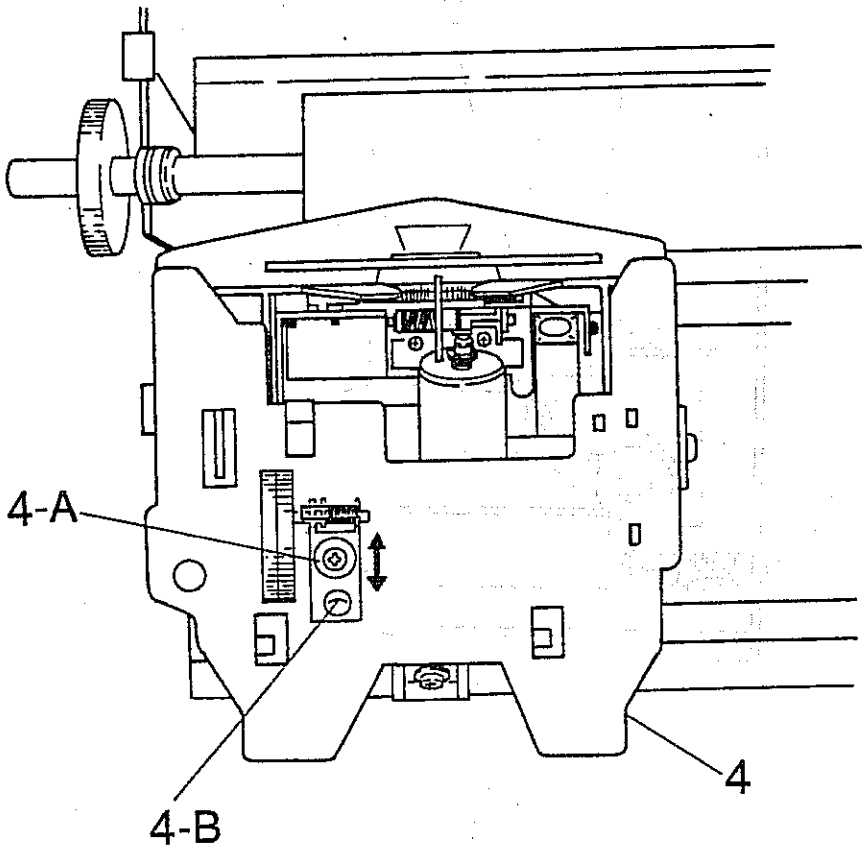
3) After making the necessary adjustments, print vertical lines and underlines, and make corrections. Confirm that the tops of the vertical lines and the bottoms of the underlines are within the prescribed distance from the edges of the tapes.

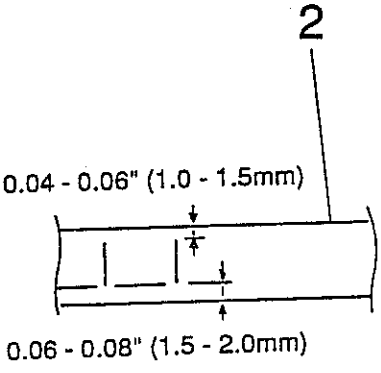
Confirmation: Make sure that printed characters are not missing any parts, and that when corrections are made, the entire character is removed completely. Also, with the ribbon cassette base (4) raised to the highest position, make sure that the teeth of the correct feed ratchet gear (3-C) are engaged about halfway with the ribbon cassette base hook (4-C) and the ratchet hook (3-D).

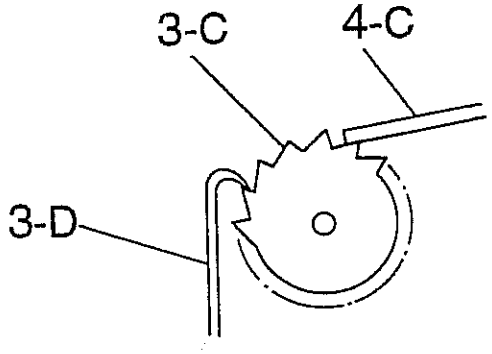
Possible symptoms: Missing parts of characters, or corrected characters that do not disappear or only partly disappear.


3-B
3-A
4


1
0.03 - 0.05" (0.8 - 1.2mm)
0.04 - 0.08" (1.0 - 2.0mm)


4-A
4-B
4


2
0.04 - 0.06" (1.0 - 1.5mm)
0.06 - 0.08" (1.5 - 2.0mm)


3-C
4-C
3-D

### 4.4.6 Carrier Drive Tension

Check: The tension on the belt tension spring (1) must be applied evenly to the entire drive belt (2).

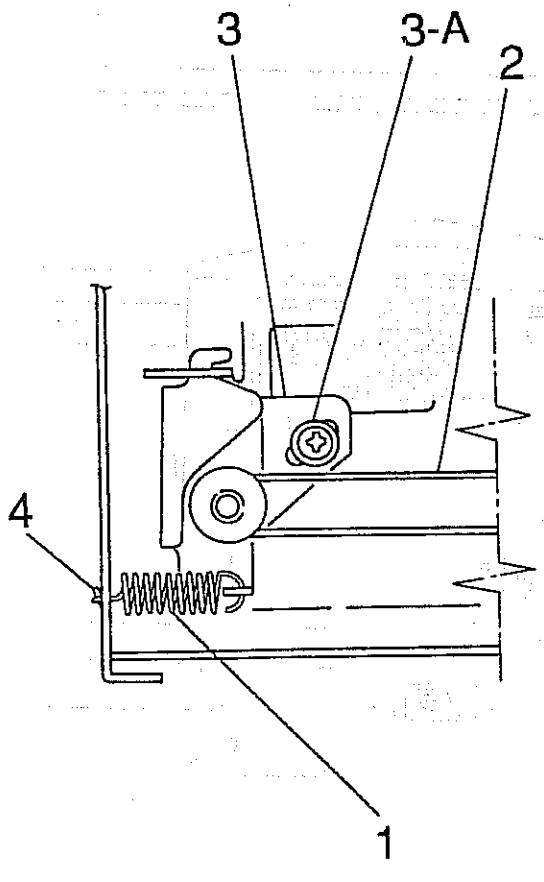
Adjustment:

1) After loosening the screw (3-A), hook the belt tension spring (1) onto the idle pulley bracket (3) and the left slide frame (4).

2) After moving the carrier to the right edge, move it to the left approximately 0.2 inches (5.0mm) to 0.8 inches (20.0mm). (This causes the tension of the belt tension spring (1) to be applied evenly to the entire drive belt (2).)

3) Loosen the screw (3-A) and fix the idle pulley bracket (3) in place.

Possible symptoms: Incorrect adjustment can cause the carrier motor to "step out", can cause characters to be shifted horizontally, and can cause problems with corrections.



### 4.4.7 Line Locator Adjustment

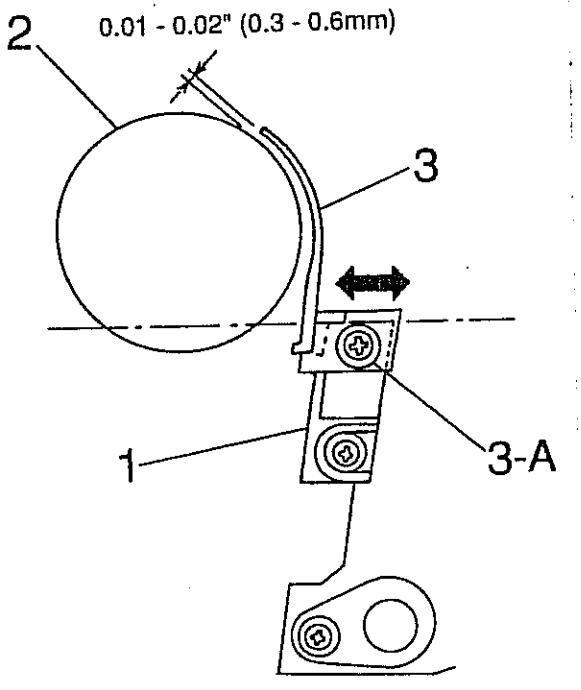
Check: The front plate (1) must be mounted with no gaps.
The gap between the platen (2) and the line locator (3) must be between 0.01 to 0.02 inches (0.3 to 0.6mm).

Adjustment:

1) Loosen the left and right screws (3-A) for the line locator (3) and adjust the gap between the platen (2) and the line locator (3) so that it is 0.01 to 0.02 inches (0.3 to 0.6mm). In addition, the bottom lines of characters must be roughly parallel with the dotted line on the line locator.

2) Tighten the left and right screws (3-A) and fix the line locator (3) in place.

Possible symptoms: Shifting of printed characters due to the paper being only loosely held in place. Problems with movement due to the pressure of the paper and the platen. (Carrier motor "step out" or problems with the carrier home position.)



# 5. Disassembly and Reassembly

## 5.1 Housing

### Removal

1) After confirming that the power switch is off, unplug the power supply cord (1) from the outlet.

2) Remove the keyboard cover (2).

3) Pull the platen knob (3) straight off.

4) Remove the top cover (5) and the cord cover (6) from the main cabinet (4).

5) Remove the paper stand (7) from the top cover (5).

6) After removing the left and right paper bail springs (8), remove the paper bail assembly (9) from the main cabinet (4).

7) Push from the rear of the main cabinet so that the LCD cover hook (10-A) releases. Although the LCD cover hook (10-A) is released, the LCD cable (11) is still attached, so lift the LCD cover (10) carefully.

8) Disconnect the LCD cable (11) from the LCD (12).

9) Remove the two screws (13) and then remove the LCD (12) from the LCD cover (10).

10) Remove the LCD cable (11) from the hole (4-A) in the main cabinet.
Remove the three screws (14) and then remove the main cabinet (4) from the bottom cabinet (15).

11) Remove the three screws (16) and then remove the PCB cover (17) from the bottom cabinet (15).

12) Remove the handle (18) from the bottom cabinet (15).

13) If necessary, remove the function sheet (19-A) and the LCD cover sheet (19-B).

14) If necessary, pull the ferrite core (20) from the LCD cable (11).

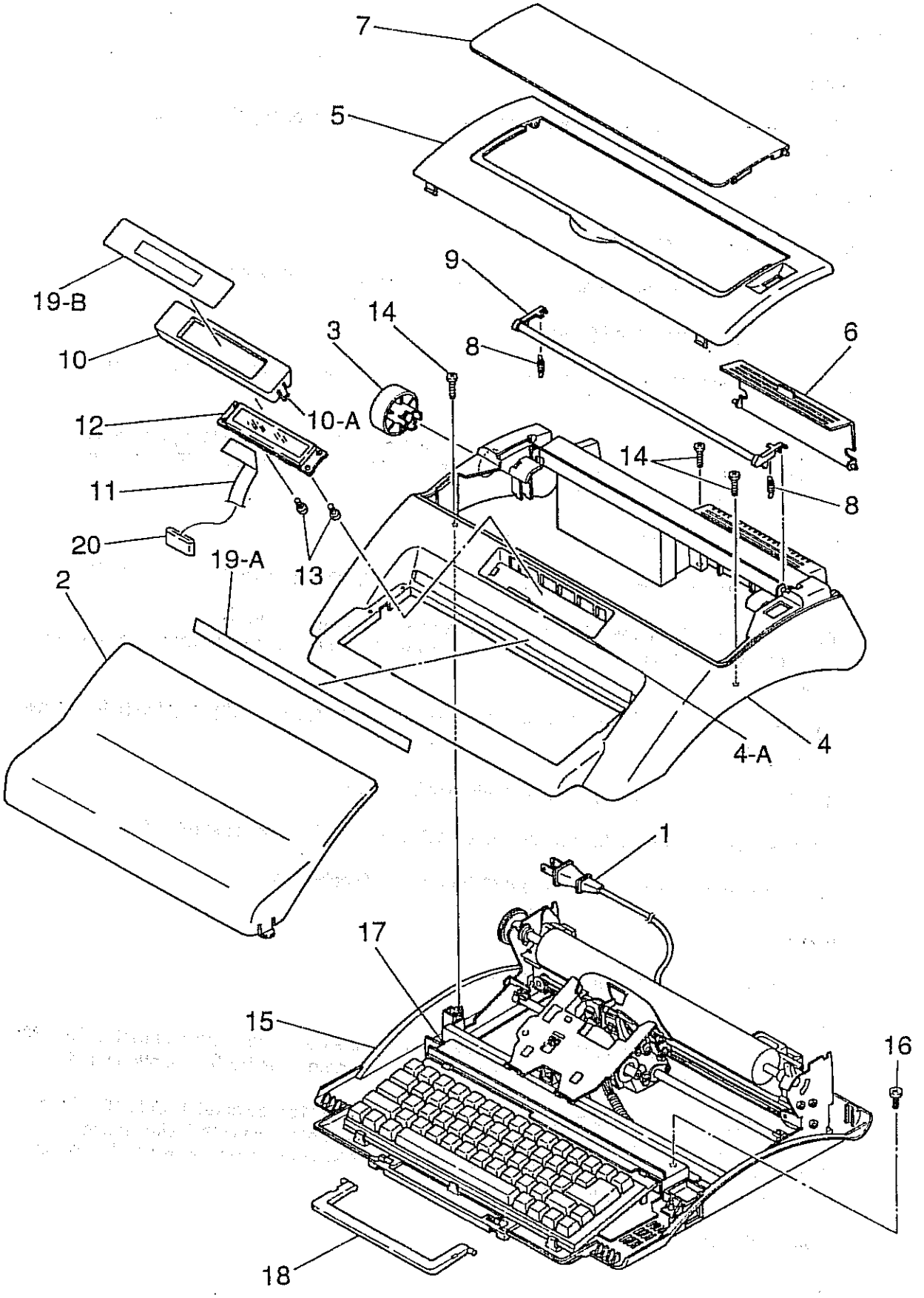
### Reassembly

Reverse the procedure described above.

Note:
Do not bend the LCD cable (11) when plugging it into the connector. Make sure that the connectors and the LCD cable (11) is both oriented in the same direction before attempting to connect it.
When attaching the main cabinet (4) to the bottom cabinet (15), be careful not to pinch the power cord and lead wires between the hooks or the cabinets. (Refer to "Wire Routing.")
If the function sheet (19-A) or the LCD cover sheet (19-B) are removed (peeled off), use new ones when re-assembling the unit.

### Readjustment

None.


7
5
19-B
10
9
14
3
8
6
12
10-A
14
11
8
20
19-A
13
2
4-A
4
1
17
15
16
18

## 5.2 Keyboard and Control PCB

### Removal

**Keyboard:**

1) Remove the housing. Make sure that the PCB cover has been removed.

2) Remove the left and right FG wires (2) from the keyboard (1).

3) Unplug the two flat cables (3-A) for the keyboard (1) from the control PCB (4).

4) After unhooking the two hooks (5-A) at the top of the keyboard (1), free the keyboard assembly (1) from the two bottom hooks (5-B).

5) Remove the screw (7) for the keyboard support panel (6).

6) Free the 12 hooks for the keyboard support panel (6).

7) Remove the keyboard support panel (6) and the membrane sheet (3).

8) Remove the two LEDs (8) (power = green; shift = red) and the contact rubber (9) from the keyboard panel (10).

9) Removing each keytop (11) makes it possible to remove the corresponding contact spring (12) and the key spring (13). Remove the subspring (15) for the space bar (14).

10) Remove the crank shafts (18, 19) from the space bar (14), left shift key (16), and the return key (17).

**Control PCB:**

1) Following steps 1 and 3 above, remove the housing and the keyboard assembly.

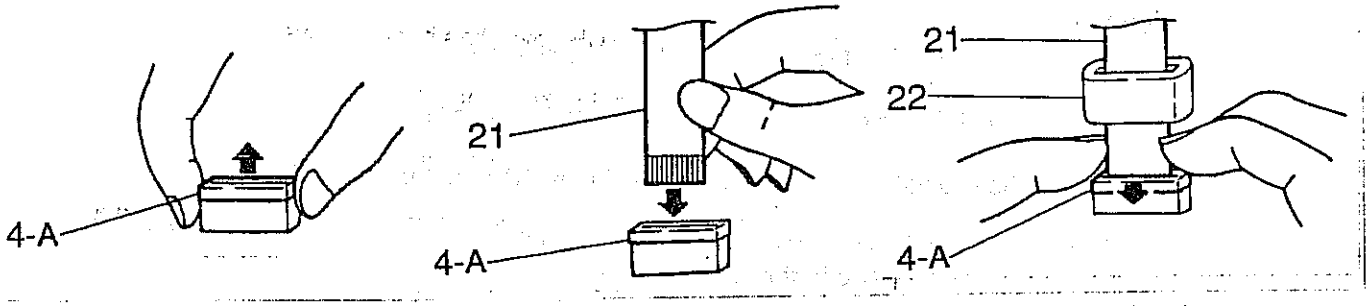
2) Disconnect the seven connectors for the power supply (CN201), selection motor (CN-202), ribbon motor (CN203), carrier motor (CN204), LF motor (CN205), hammer solenoid (CN206), left end switch (CN207), and the LCD cable (CN210) from the control PCB (4). Lift (release) the connector housing (4-A) for the connector (CN210) before disconnecting the LCD cable (21). To disconnect the connector on the LCD, simply pull out the cable.

   Note:
   When removing the LCD cable (21), be careful not to lose the ferrite core (22).

3) Remove the three screws (20) holding the control PCB to the bottom cabinet (5), free the four hooks (5-C), and remove the control PCB (4).

**Reassembly**

Reverse the procedure described above.




Lift the connector housing (4-A).

Plug the LCD cable (21) straight into the connector.

Push the connector housing back into its original position.

Note:
Do not bend the flat cables (3-A, 21) when plugging them into their connectors. Make sure that the connectors and the flat cables (3-A, 21) are both oriented in the same direction before attempting to connect them.

**Readjustment**

None.

**Using the spelling check function (models that permit installation and the installation method)**

The American and Spanish dictionaries can be used with the Spain and Hispano keyboards.
The American and French dictionaries can be used with the France and Canada-France keyboards.
The American and German dictionaries can be used with the Germany keyboards.
The American dictionary can be used with the U.S.A. and U.K. keyboards.

**Case 1**
When the control PCB artwork number is 999-32300, the gate array (IC202) is the NEC μPD65006CW-A19, and the EP ROM (IC203) is suited for the previous keyboard specifications and is not compatible with the spelling check function (ver. 1.0_):

**Conversion work**
Replace the gate array (IC202) with the NEC μPD65006CW-A22, replace the EP ROM (IC203) with one that is suited for the previous keyboard specifications and is compatible with the spelling check function (ver. 2.0_), solder IC204 in the IC socket, and install the mask ROM.

Or,
Replace the gate array (IC202) with the NEC μPD65006CW-A22, replace the EP ROM (IC203) with a 4M bit mask ROM (ver. 3.0_) that is suited for the previous keyboard specifications. Remove the jumper wire from J207 and J209, and connect the jumper wire to J206 and J208.

**Case 2**
When the control PCB artwork number is 999-32300, the gate array (IC202) is the NEC μPD65006CW-A22, and the EP ROM (IC203) is suited for the previous keyboard specifications and is not compatible with the spelling check function (ver. 1.0_):

**Conversion work**
Replace the EP ROM (IC203) with one that is suited for the previous keyboard specifications and is compatible with the spelling check function (ver. 2.0_), solder IC204 in the IC socket, and install the mask ROM.

Or,
Replace the EP ROM (IC203) with a 4M bit mask ROM (ver. 3.0_) that is suited for the previous keyboard specifications. Remove the jumper wire from J207 and J209, and connect the jumper wire to J206 and J208.

**Case 3**
When the control PCB artwork number is 999-32300, the gate array (IC202) is the NEC μPD65006CW-A22, and the EP ROM (IC203) is suited for the previous keyboard specifications and is compatible with the spelling check function (ver. 2.0_):

**Conversion work**
Solder IC204 in the IC socket, and install the mask ROM.

Or,
Replace the EP ROM (IC203) with a 4M bit mask ROM (ver. 3.0_) that is suited for the previous keyboard specifications. Remove the jumper wire from J207 and J209, and connect the jumper wire to J206 and J208.

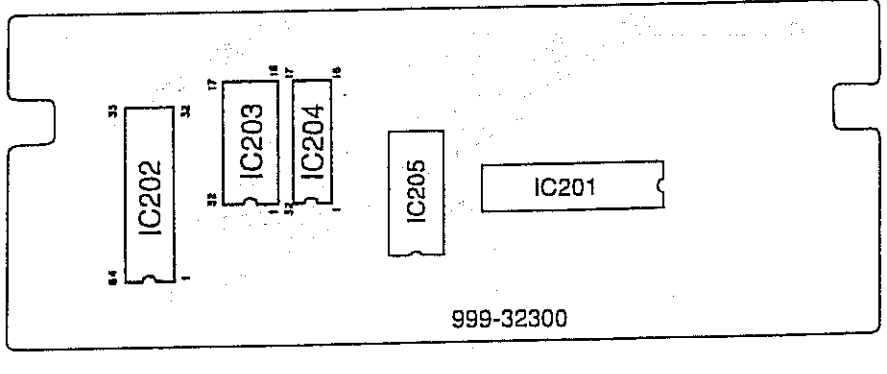
**Case 4**
When the control PCB artwork number is 999-32300, the gate array (IC202) is the NEC μPD65006CW-A22, and IC203 is a 4M bit mask ROM (ver. 3.0_) suited for the previous keyboard specifications:

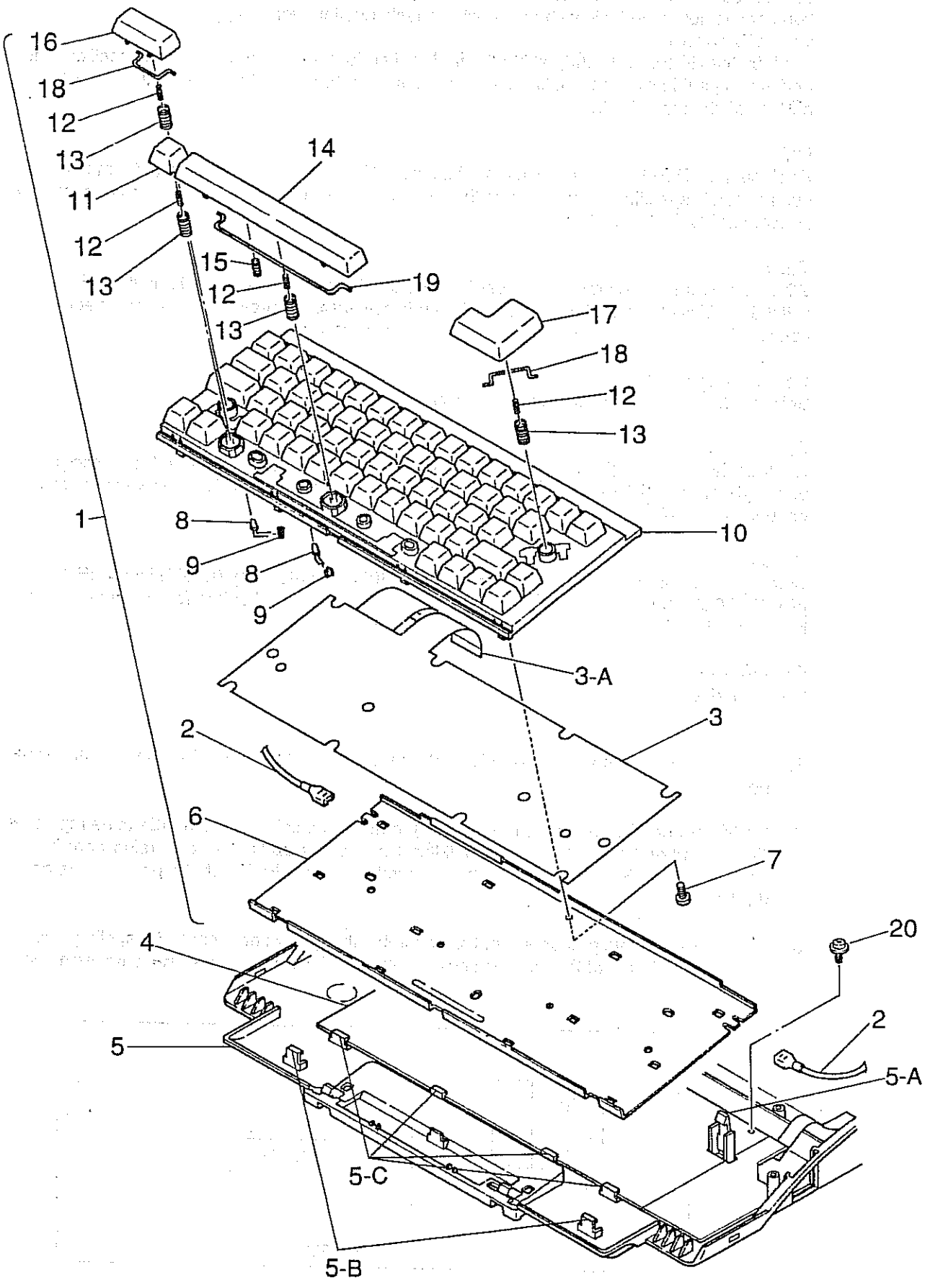
**Conversion work**
None needed.

1) Remove the housing, keyboard (1), and remove the control PCB (4) from the bottom cabinet (5).

2) On the bottom side of the control PCB (4), remove the solder from the ICs to be replaced (IC202 and/or IC203), and then install the ICs as described in the conversion work for case 1, 2 or 3. Be sure to match the pin numbers on the PCB with the pin numbers on the ICs.

3) Reverse the above procedure and re-assembly the typewriter. (Apply the spelling check labels to the fronts of the keys as shown in the key illustration in the operating instruction.)

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18
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13
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9
8
9
10
3-A
3
2
6
7
20
4
5
2
5-A
5-C
5-B

## 5.3 Chassis Frame and Platen

### Removal

**Chassis frame:**

1) Remove the housing and the FG wires.
   Disconnect the seven connectors from the control PCB.

2) Remove the lead wires from the bottom cabinet (1). In order to remove the chassis frame (2) from the groove in the bottom cabinet (1), lift the frame (2) forwards about 0.8 inches (20mm), and then pull the frame out and away.

**Platen and feed rollers:**

1) Remove the housing.

2) Remove the paper release spring (3).

3) Remove the platen journal pin (4-A) from the hole (2-A) in the side frame L.
   Turn the platen journal pin (4-A) 90° forward, line up the groove (2-B) in side frame L with the protrusion (4-B) on the platen journal, and then remove the platen journal (4) from side frame L (2-B).

4) Tilt the platen (5) up and to the left and pull it out.

5) Remove the paper release lever (6) from the right shaft of the platen (5).

6) Remove the two E-rings (7) from the left shaft of the platen (5).

7) Pull the platen gear (8), platen washer (9), platen arc washer (10) and platen journal (4) from the left shaft of the platen (5).

8) Remove the paper pan (11) on the left and right protrusions (2-C) of the center frame.

9) Push the four feed rollers (12) out from the bottom of the paper pan (11) and remove them.

10) Lift the right side of the paper release arm (13) slightly, slide it to the left, and then remove it from the protrusion (2-D) on the center frame.

11) Normally, there is no need to peel off the deflector sheet (14) on the bottom of the paper pan. Be careful not to scratch the deflector sheet (14) when the paper pan (11) has been removed.

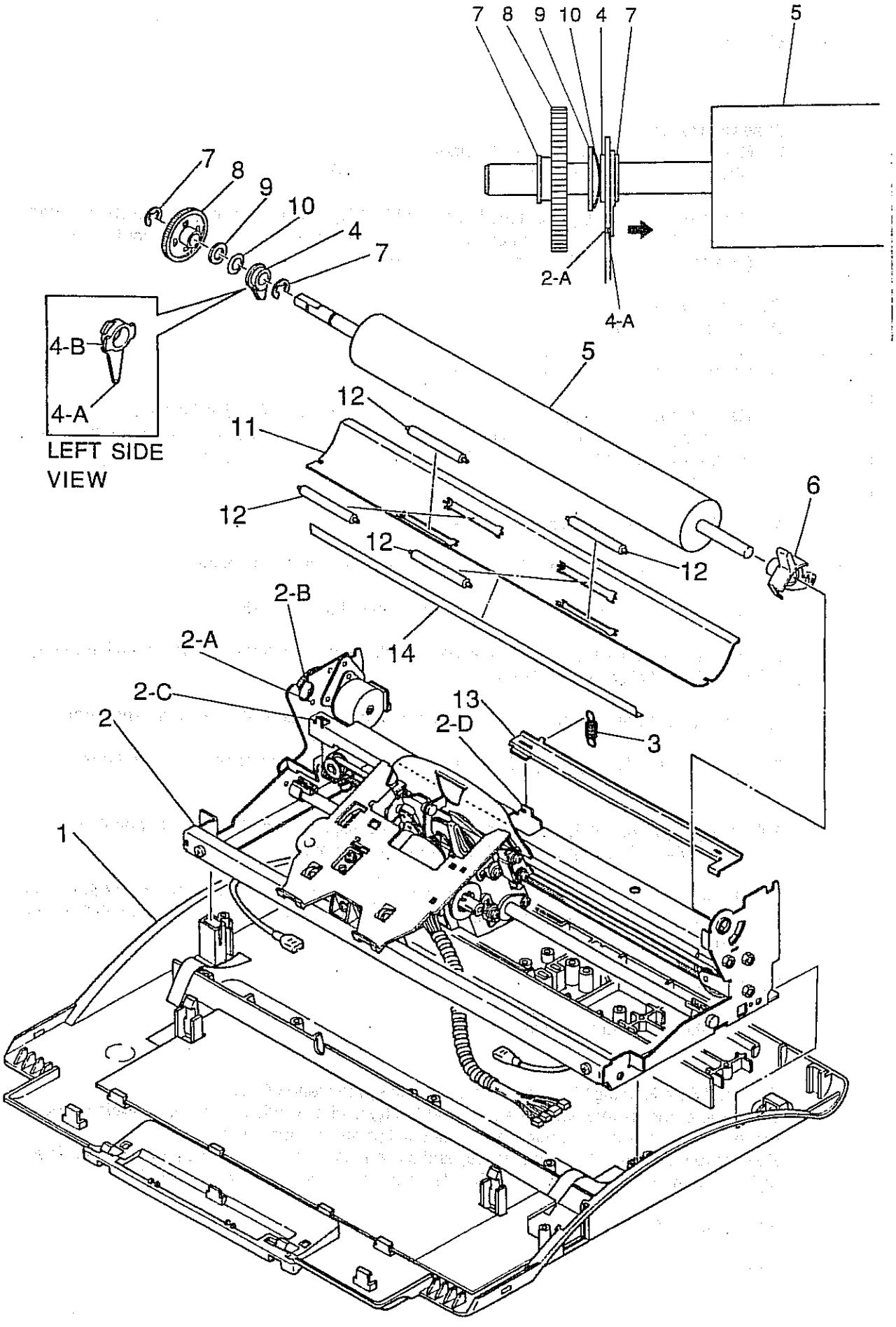
### Reassembly

Reverse the procedure described above.

Note:
Refer to "Wire Routing" for details on the routing of the lead wires.
When the carrier is moved, make sure that the lead wire bundle in the carrier cable guide moves smoothly and does not catch on any of the other components.
Be sure to install the platen washer (9) and the platen arc washer (10) so that they are in that order from the outside in, between the platen gear (8) and the platen journal (4).

### Readjustment

None.


7
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9
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4
7
5
2-A
4-A
4-B
4-A
LEFT SIDE
VIEW
12
11
12
12
12
6
2-B
2-A
2-C
14
13
2-D
3
2
1

## 5.4 LF (Line Feed) Motor and Carrier Drive

### Removal

**LF (line feed) motor:**

1) Remove the platen.

2) Remove the LF motor spring (1).

3) Remove the LF middle gear (2).

4) Remove the LF motor plate screw (3).

5) Remove the two screws (6) holding the LF motor (4) to the LF motor plate (5) and then remove the LF motor (4).

**Carrier drive:**

1) Remove the platen.

2) Remove the screw (8) holding the belt clamp (9) from the hole in the center frame (7-A).

3) Remove the left and right carrier stoppers (10). Remove the main shaft bracket screw (11) and then remove the main shaft bracket (12). Pull the main shaft (13) out of the hole in the side frame (7-B).

4) The carrier can now be removed from the frame (7).

5) Remove the carrier motor spring (14).

6) Remove the carrier motor bracket screw (15).

7) Remove the two screws (18) holding the carrier motor (16) to the motor bracket (17), and then remove the carrier motor (16).

8) Remove the belt tension spring (19).

9) Remove the screw (20), and then remove the idle pulley bracket assembly (21).

10) Remove the E-ring (22) and then remove the idle pulley (23).

11) Pull the drive pulley shaft (24) out from the back of the frame (7); the drive pulley (25), drive pulley cap (26), and the drive belt (27) can now be removed.

12) Remove the two screws (28) holding the left and right FG wires (29).

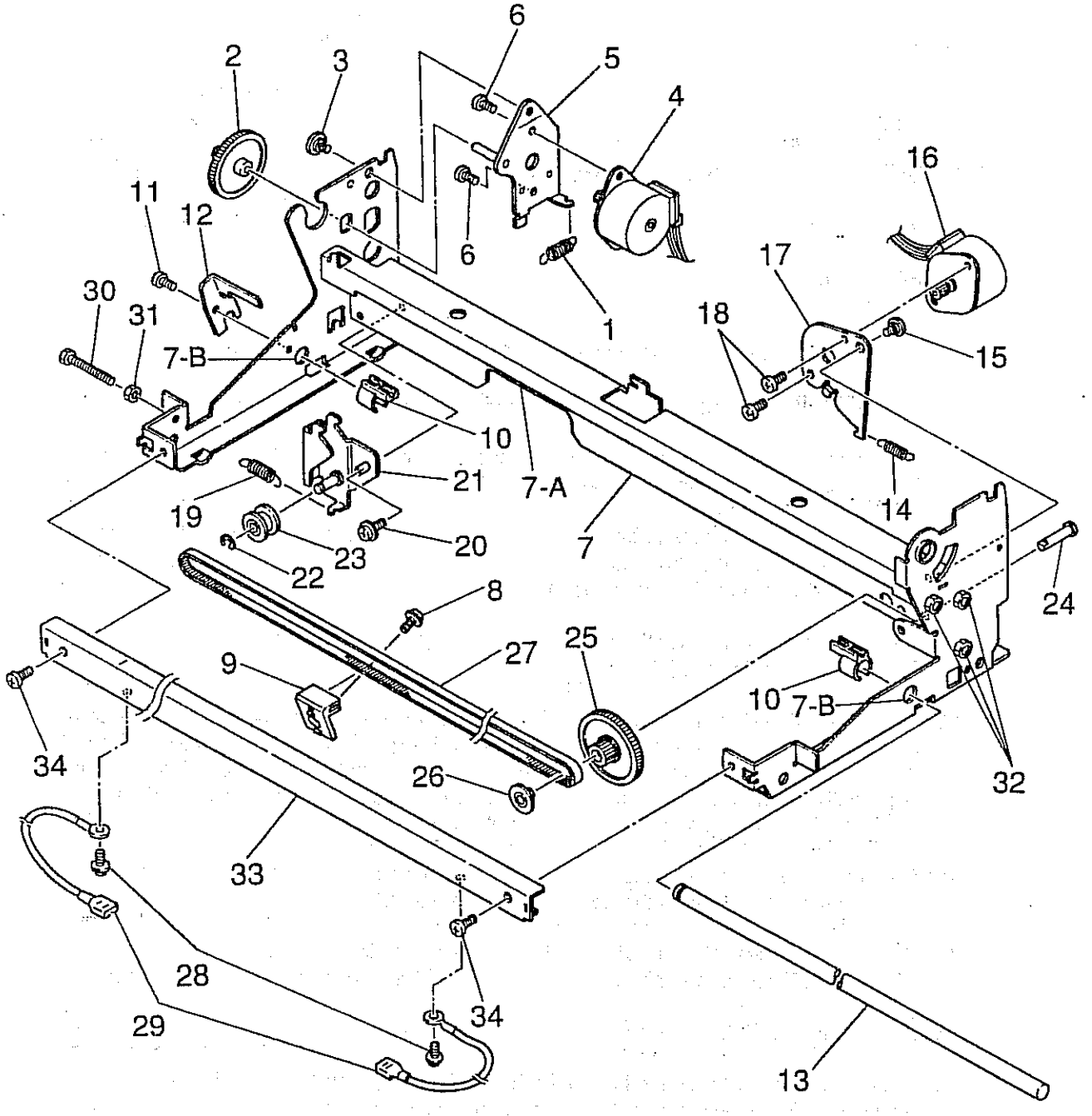
13) Unless it is necessary to readjust the adjustment screw (30) and nut (31), do not loosen or remove them. In addition, do not remove the nut (32) attaching the side frame to the center frame.
When removing the carrier without removing the platen, it is possible to remove the carrier guide rail (33) and then remove the carrier from the frame (7) by following the procedure described in steps 2 through 4 above. Remove the two screws (34) from the carrier guide rail (33).

### Reassembly

Reverse the procedure described above.

**Readjustment**

The carrier drive belt tension adjustment will be necessary.
The carrier home position adjustment will be necessary.
Make sure that the carrier motor gear and the LF motor gear are not loose.
When the side frame, center frame, and carrier guide rail have been removed, place them on a flat, stable surface and make sure that they are not bent or warped.


6
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4
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7-B
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7-A
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23
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27
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10
7-B
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13

## 5.5 Cassette Base and Ribbon Drive

### Removal

1) Remove the ribbon cassette and the correction tape.

2) Remove the carrier from the chassis frame.

3) Remove the ribbon cassette base spring (2) from the carrier box (1).

4) Remove the two screws (5) holding the ratchet hook (3) and the ribbon base stopper (4) in place.

5) Use a long, thin rod through the hole (6-A) in the ribbon cassette base to slide the lift pin (7) to the right. Remove the lift pin (7) from the notch in the correct cam (8) and then lift up the ribbon cassette base (6).

6) Slide the ribbon cassette base (6) to the left and remove the ribbon cassette base (6) from the front hole in the carrier box (1-A).

7) Remove the E-ring (10) holding the correction tape holder (9) in place.

8) Remove the E-ring (12) holding the correction feed ratchet (11) in place.

9) Remove the correction brake spring (13), and then remove the ribbon cassette base (6) from the correction brake rack (14).

10) Remove the ribbon cassette base (6) screw (15), and then remove the lift slide plate (16). Remove the E-ring (17) from the lift pin (7), and then remove the lift pin spring (18) and the lift pin (7) from the lift slide plate (16).

11) Remove the screw (20) for the gear holding base (19). Remove the gear holding base (19) from the carrier box (1).

12) Once the E-ring (22) on the right end of the ribbon drive shaft (21) is removed, the correct cam (8), the two drive ratchets (23), the ribbon drive gear (24) and the drive bevel gear (25) can be removed. Note: Although the two drive ratchets (23) are identical, the orientation with which they are mounted affects the release direction of the cam and gear (8 and 24). (Be careful about the orientation during reassembly.)

13) Remove the E-ring (26) on the bottom of the gear holding base (19) and then remove the ribbon bevel gear (27) and the ribbon bevel gear pin (28).

14) Pull the ribbon gear (29) out of the hole in the gear holding base (19). Pull the ribbon feed pole (30) out of the ribbon gear (29) and then remove the ribbon feed pole spring (31).

15) Remove the cam stopper (32) from the carrier box (1).

16) Cut the unit band (33) on the bottom of the carrier box (1) and remove the carrier cable guide (34). The lead wires for the ribbon motor, selection motor, hammer solenoid, and left end switch can now be unbundled.

17) Remove the screw (35) on the front of the carrier box (1) and then remove the rail slide (36).

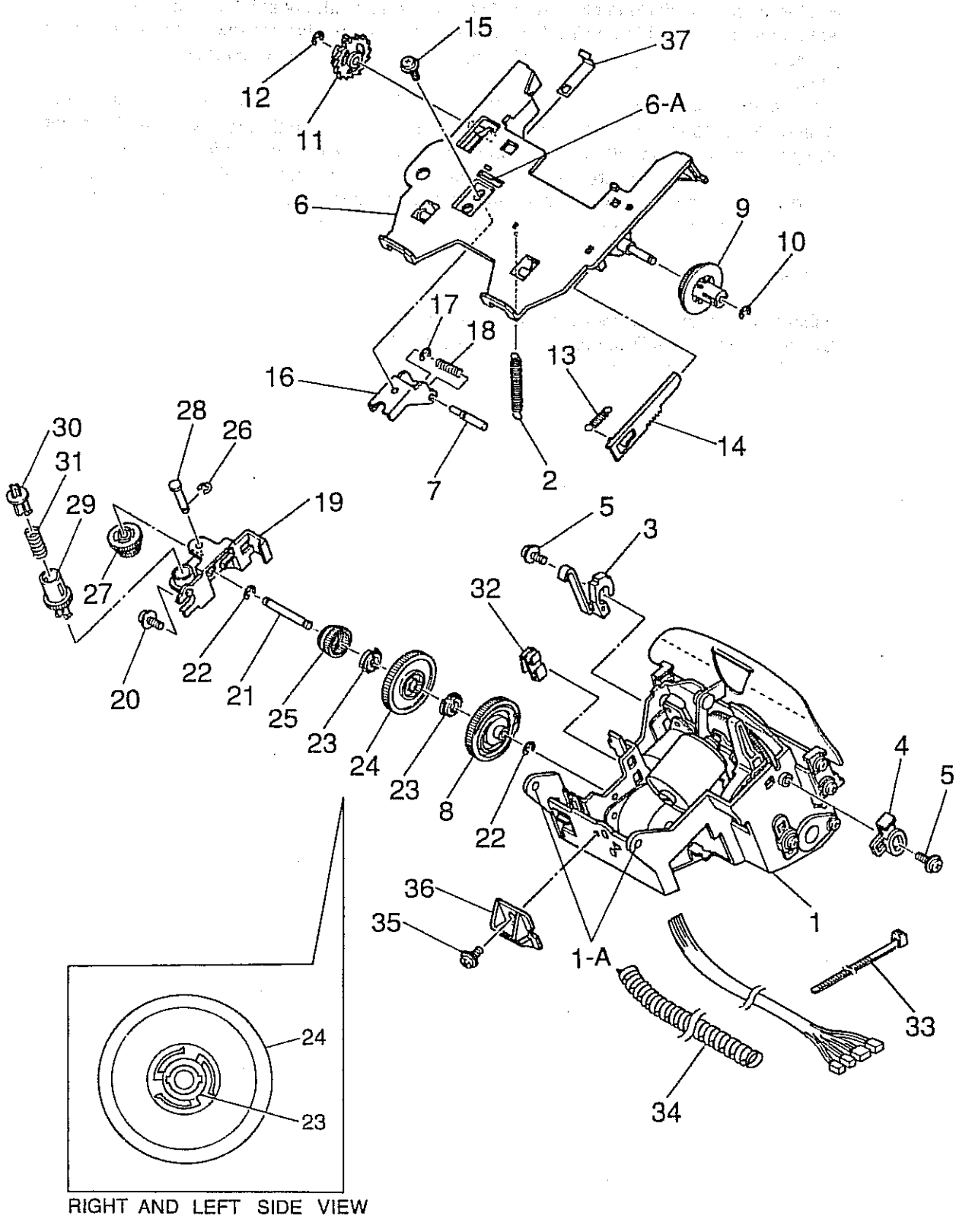
18) Do not remove the cassette holding spring (37) unless necessary, as removing and reinstalling it will make it loose.

**Reassembly**

Reverse the procedure described above.
Fix the ratchet hook (3) in place roughly at the center of the oval hole. With the ribbon cassette base (6) up as high as it will go, engage the hook on the ribbon cassette base (6) and the ratchet hook (3) approximately half way with the teeth on the correct feed ratchet gear (11).
Hand-tighten the lift slide plate (16) and the rail slide (36) at approximately the center of the oval hole. Because the carrier box is an assembly, be aware that repeated re-attachment of the gear holding base (19), etc., will cause the screws to lose their gripping ability.
If the drive ratchets (23) are re-attached with the wrong orientation, the correct cam (8) and the drive bevel gear (25) will turn in either direction. In this case, reverse the orientation of the drive ratchets and then attach the ribbon drive gear (24).

**Readjustment**

Ribbon tape position adjustment will be necessary.
Correction tape lift adjustment will be necessary.
Rail slide position adjustment will be necessary.




RIGHT AND LEFT SIDE VIEW

## 5.6 Selection and Hammer

**Removal**

1) Remove the cassette base and the ribbon drive mechanism. Make sure that the tie has been cut and that the carrier cable guide has been removed.

2) Remove the wheel release spring (1).

3) Remove the left and right screws (2) from the carrier box and then remove the carrier metal (3).

4) Remove the two screws (4) and then remove the adjust plate (5). Remove the selection plate complete (7) from the carrier box (6).

5) Remove the two screws (8) and then remove the line locator (9).

6) Remove the two screws (10) and then remove the front plate (11). The front plate spring (12) and the push disks A and B (13-A and 13-B) are normally not removed.

7) Remove the two screws (14) from the left side of the carrier box and then remove the ribbon motor (15).

8) Use radio pinchers to pull the front protrusion (6-A) on the carrier box, pulling the left end switch (16) out of the carrier box. Be careful not to break the protrusion (6-A).

9) Remove the two screws (17) and remove the selection motor (18) from the selection plate complete (7).

10) Remove the wheel set hook (20) from the wheel hook screw (19).

    Note:
    Original and new (March '94) parts (19 and 20) are not mutually interchangeable.

11) Remove the selection gear stopper (21) from the selection plate complete (7). Pull the selection gears A (22) and B (23) off of the selection plate pin (7-A).
    Unhook the hook of selection gear A (22) from selection gear B (23). Remove the backlash spring (24) from selection gear A (22).

12) Remove the two screws (26) holding the hammer bracket in place (25) and then remove the hammer solenoid assembly from the selection plate complete (7).

13) Remove the release pin (27) from the selection plate complete (7), and then remove the wheel release lever (28).

14) Remove the E-ring (29). Remove the compression spring (30) and the hammer solenoid (31) from the hammer bracket (25).

15) Remove the E-ring (32), the hammer shaft (33), the hammer complete (34), the torsion spring (35), and the washer (36).

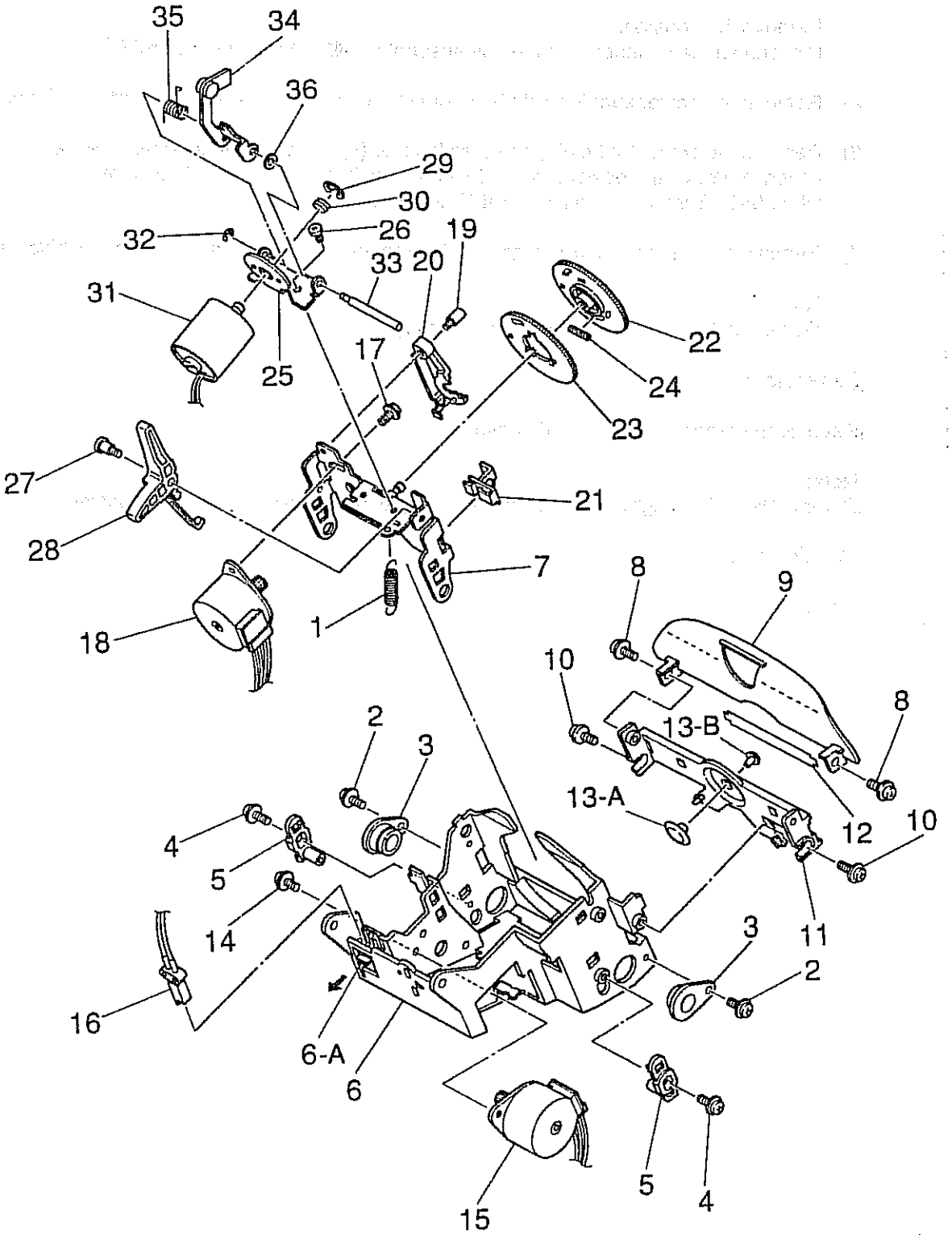
**Reassembly**

Reverse the procedure described above.

Note:
Attach the adjust plate (5) in roughly the center of the oval hole. If this position is not correct, it will not be possible to perform the rail slide adjustment properly. In addition, hand-tighten the selection motor at the right end of the upper oval hole and at the left end of the lower oval hole. Because the carrier box is an assembly, be aware that repeated re-attachment of the carrier metal (3) and the adjust plate (5), etc., will cause the screws to lose their gripping ability.
Match up the paired holes on selection gears A (22) and B (23) and then insert them onto the selection pin (7-A) with the positioning determined by the square hole on the selection plate complete (7).

**Readjustment**

Line locator adjustment will be necessary.
Selection motor home position adjustment will be necessary.
Hammer home position adjustment will be necessary.
Carrier and platen position adjustment will be necessary.
Rail slide position adjustment will be necessary.
Make sure that the ribbon motor gear and the selection motor gear are not loose.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13-B
2
3
13-A
12
10
4
5
14
3
11
2
16
6-A
6
5
4
15

## 5.7 Power Supply

### Removal

1) Remove the housing.
   Disconnect the connector for the power supply (CN201) from the control PCB.

2) Remove the power supply cord (2-A) from the protrusions (1-A) on the bottom cabinet.

3) Remove the screw (3) holding the switch cover (4) in place, and then remove the switch cover. Remove the power switch (2-B) from the bottom cabinet (1). Remove the lead wires (2-C) from the bottom cabinet (1) as well.

4) Remove the two screws (5). Remove the transformer (2-D) from the bottom cabinet (1).

   Note:
   Do not cut the unit band (6) unless necessary.

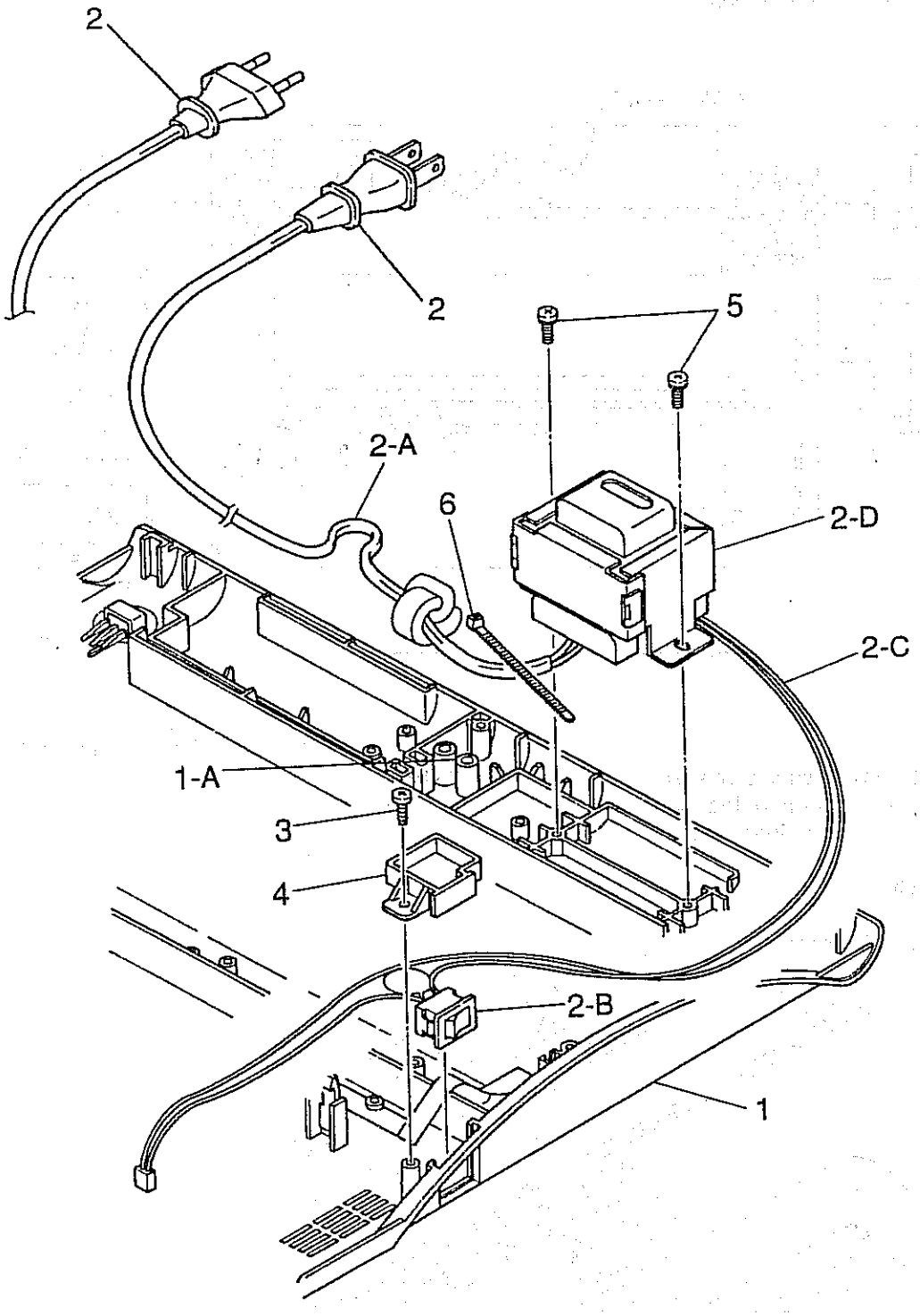
### Reassembly

Reverse the procedure described above.

Note:
Refer to "Wire Routing" for details on the routing of the power cord and the lead wires.

### Readjustment

None.


2
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2-A
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2-D
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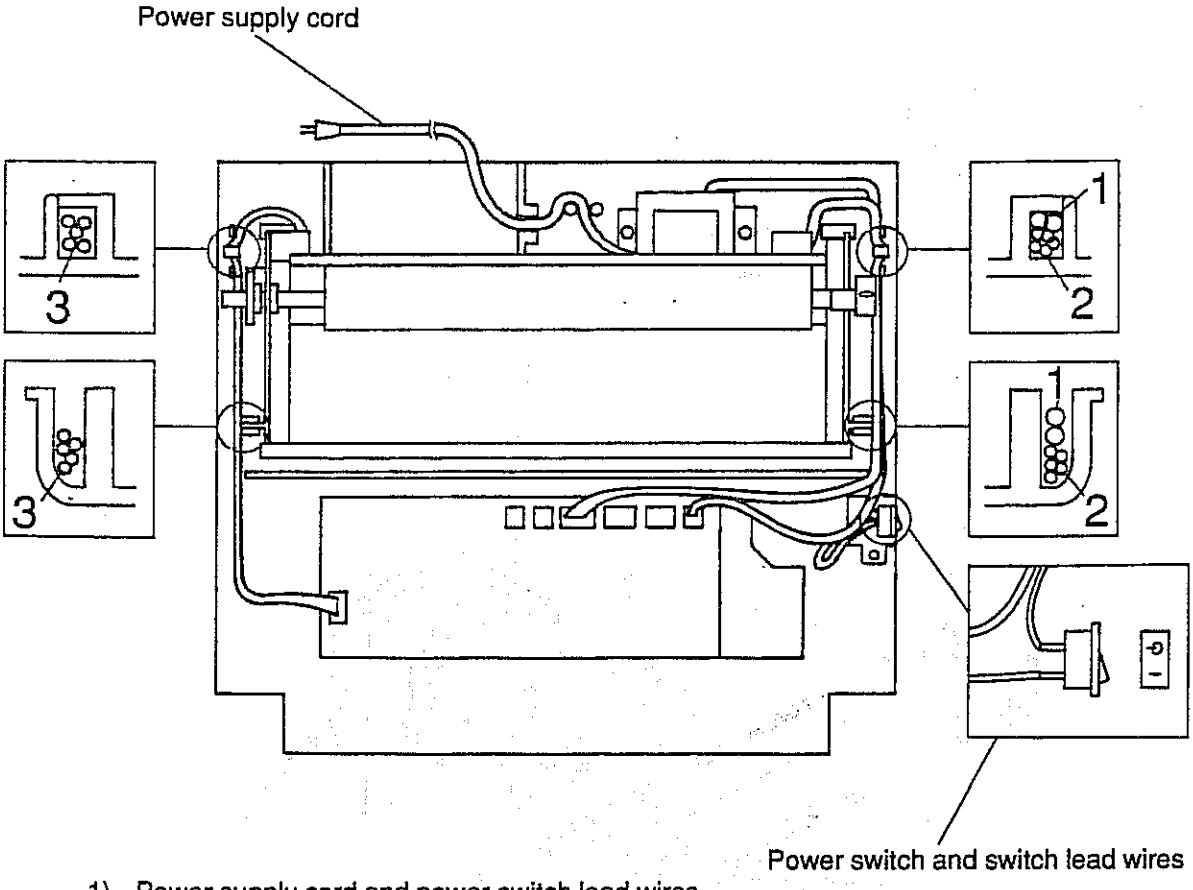
1

## 5.8 Wire Routing

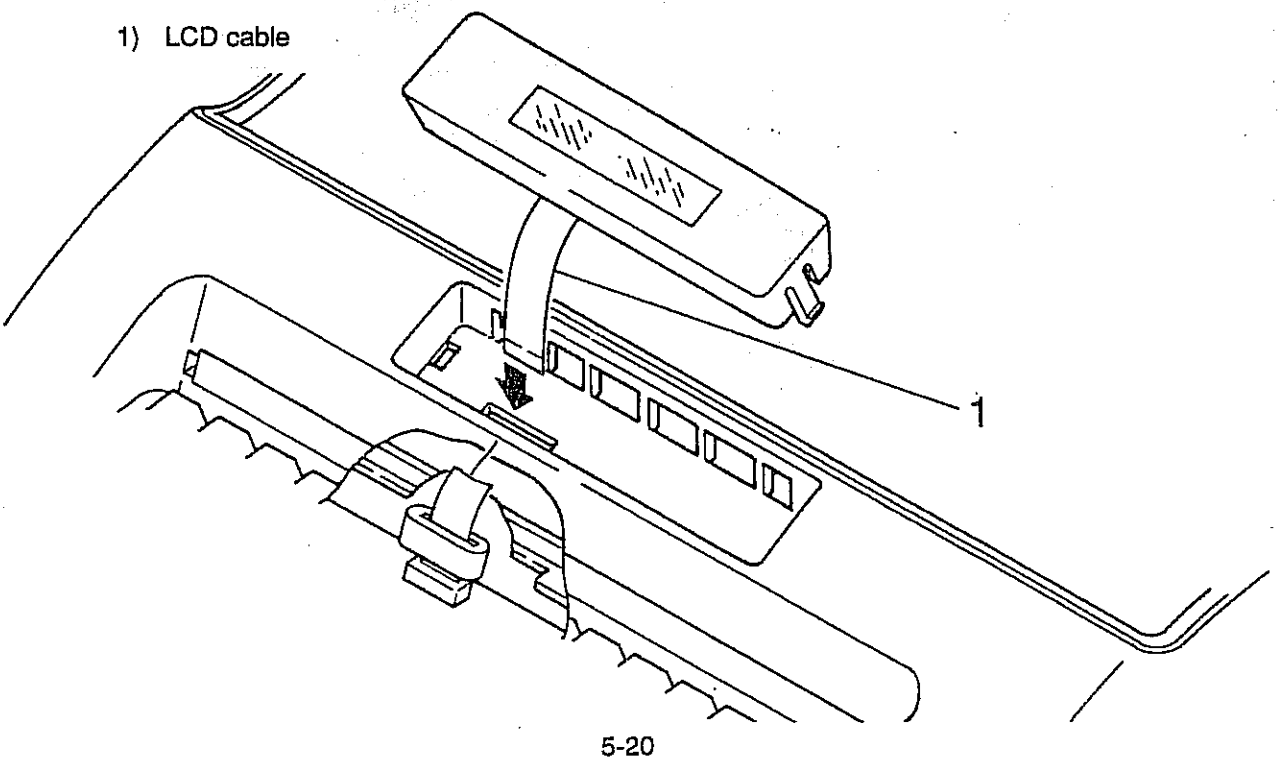
### Bottom cabinet




1) Power supply cord and power switch lead wires
2) Carrier motor lead wires
3) LF motor lead wires

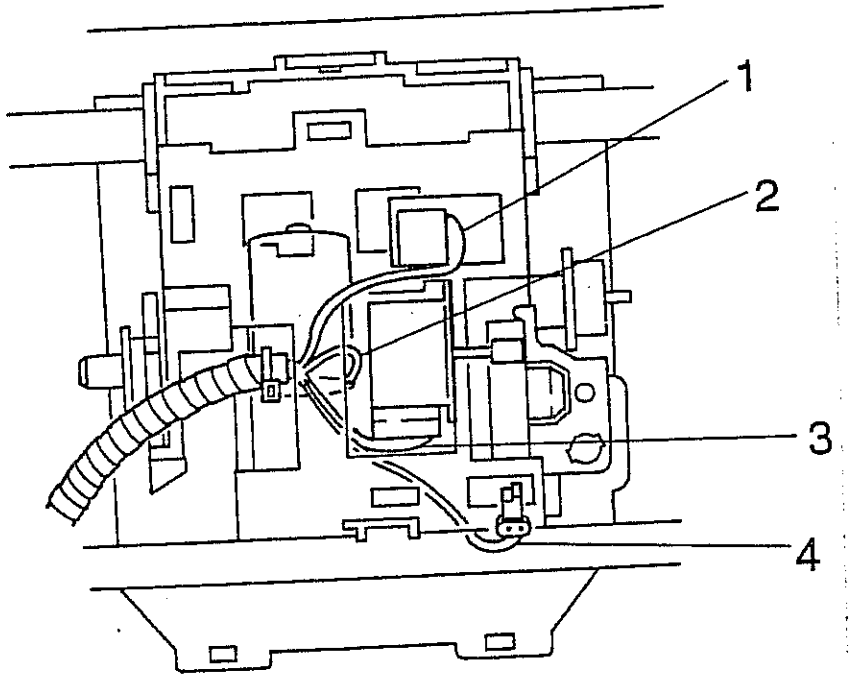
### LCD

1) LCD cable



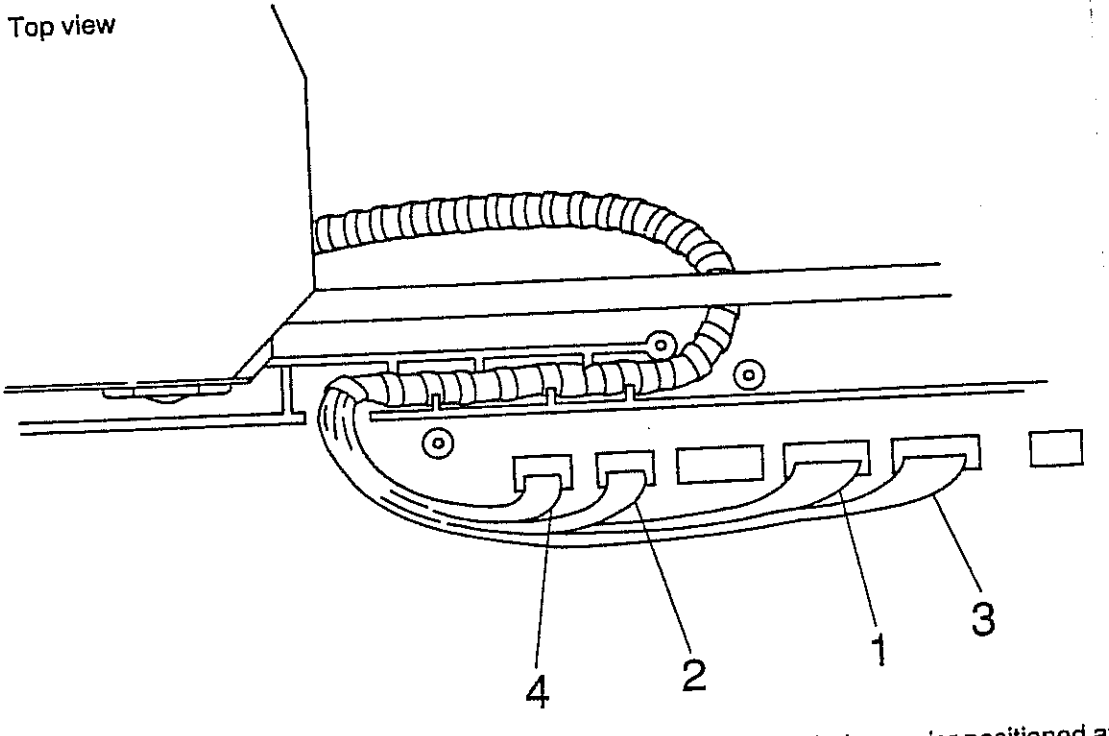
**Carrier**

Bottom view

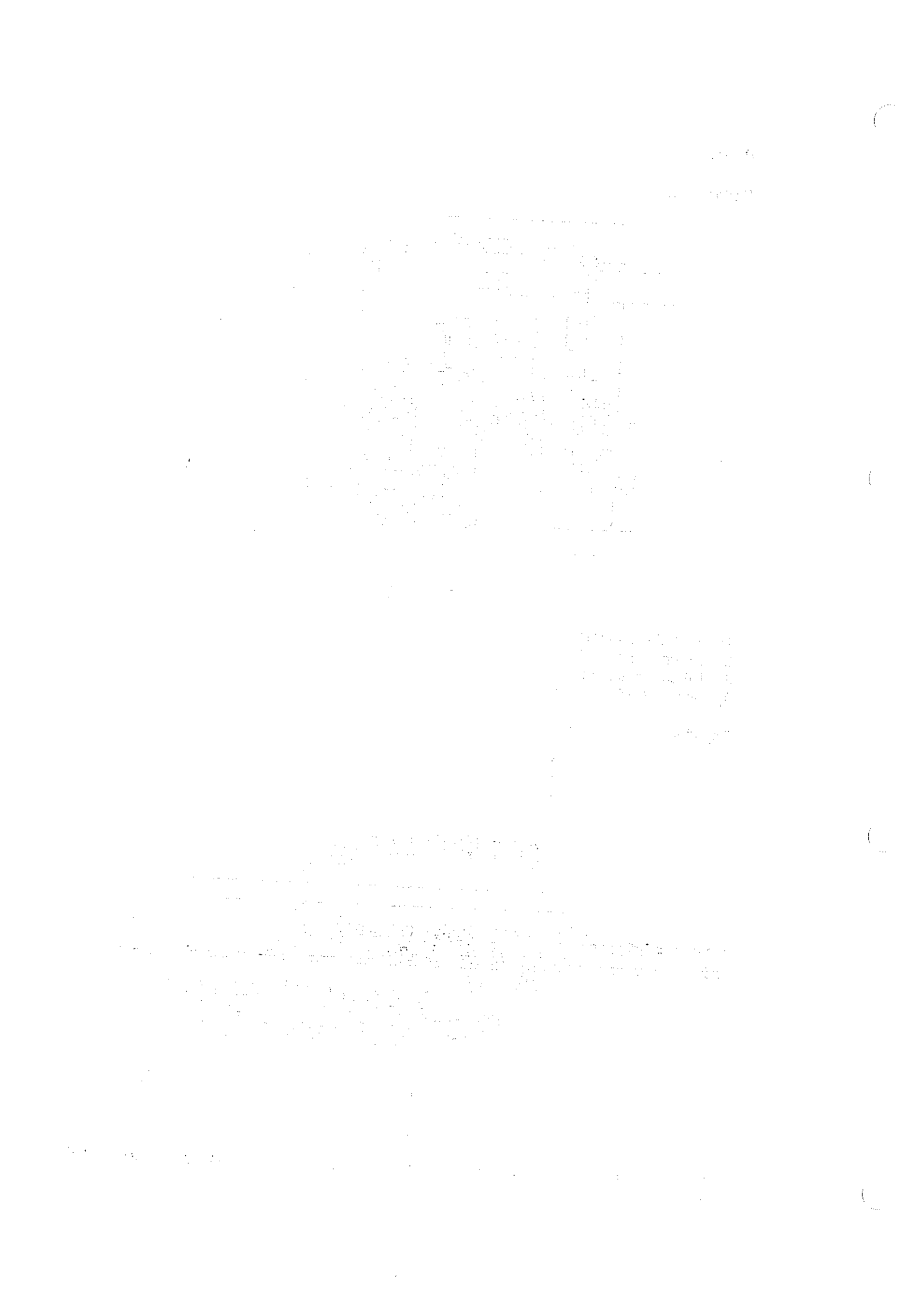



1) Selection motor lead wires
2) Hammer solenoid lead wires
3) Ribbon motor lead wires
4) Left end switch lead wires

Top view




Note:
When setting the lead wire bundle in the bottom cabinet, do so with the carrier positioned at the right end.



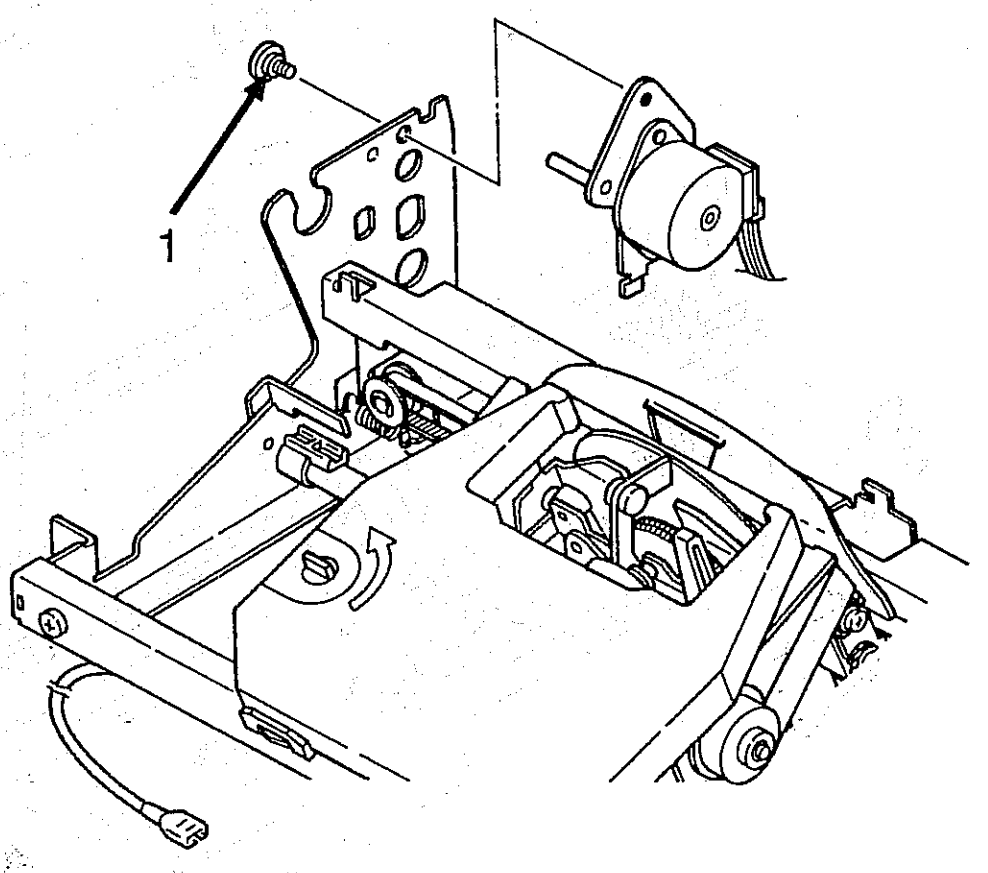
# 6. Lubrication and Cleaning

## 6.1 Lubrication

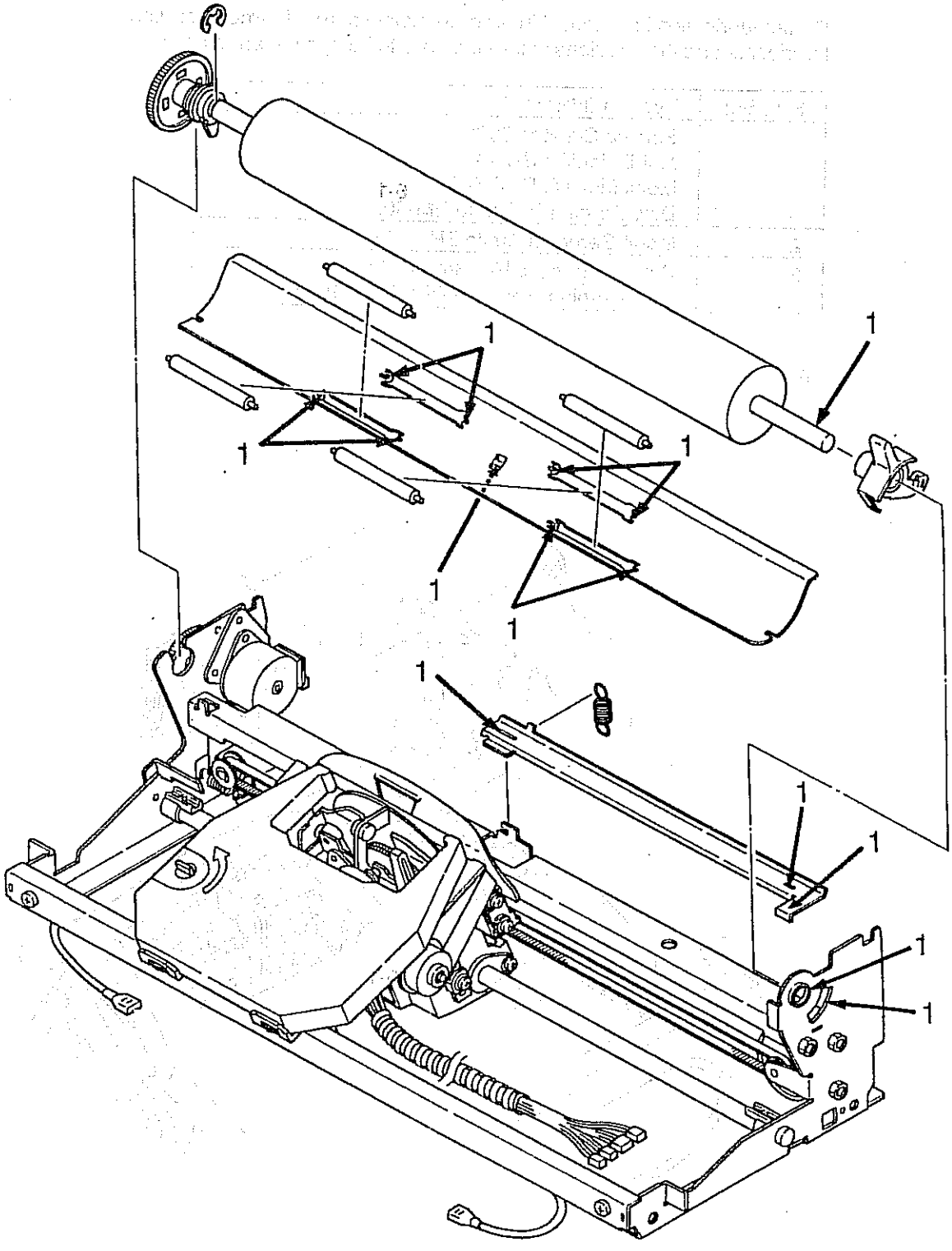
Proper lubrication is essential in order to maintain trouble-free operation. Lubricants and the locations where they are to be applied are shown below.

| Number | Type of lubricant |
|---|---|
| 1 | Sumico Sumitec #331<br>Mobil Mobilith SHC 15<br>Mobil Mobilith SHC 460<br>Dow Corning Molykote EM-60L |
| 2 | Mobil Gargoyle Arctic SHC 226 |
| 3 | Sumico Sumitec HD Grease #2<br>Dow Corning Molykote BR2 Plus Grease #2 |

LF motor



Chassis frame and platen



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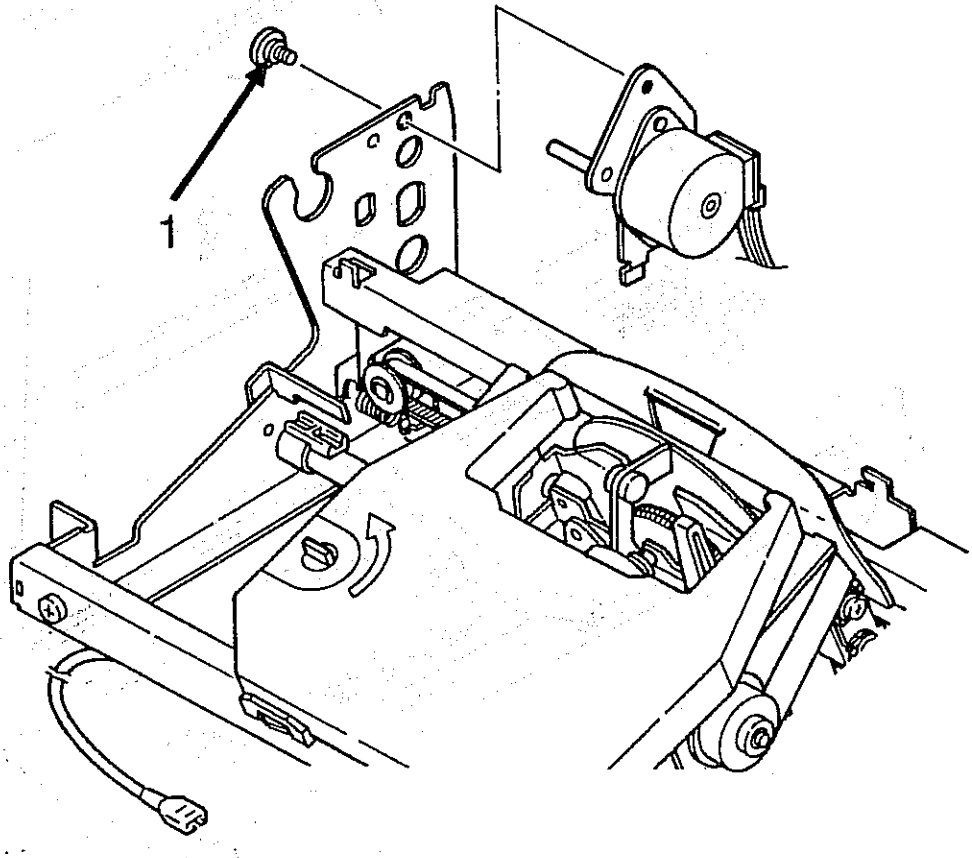
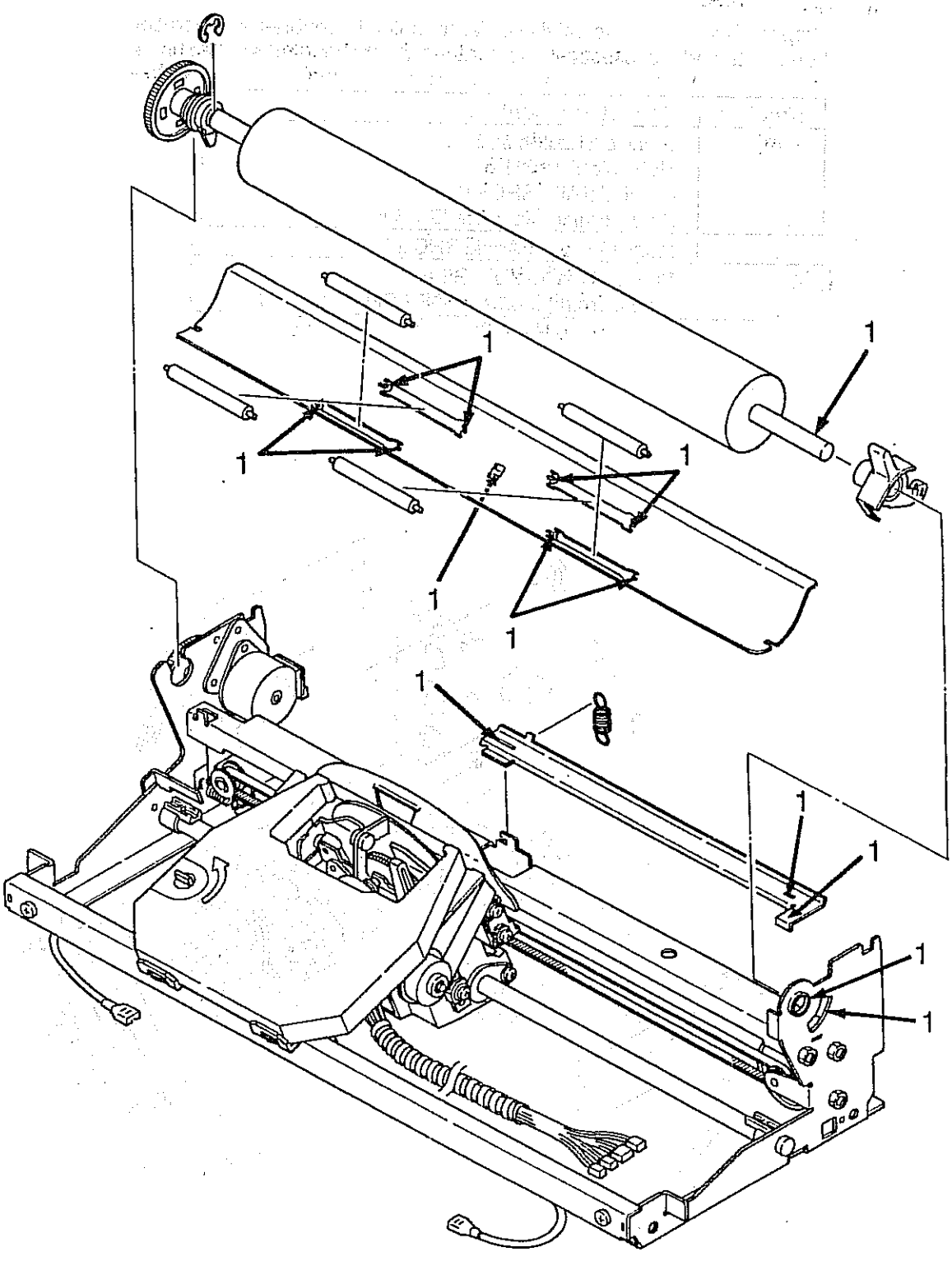
| 3 | Sumico Sumitec HD Grease #2<br>Dow Corning Molykote BR2 Plus Grease #2 |

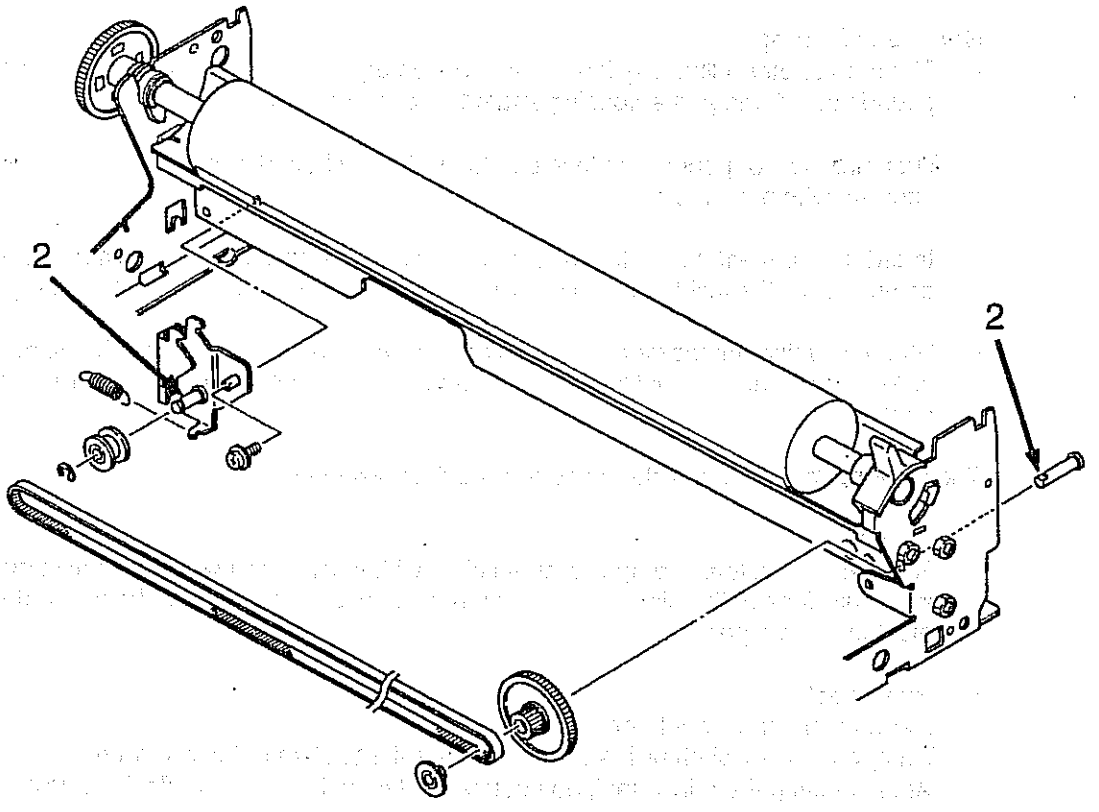
LF motor



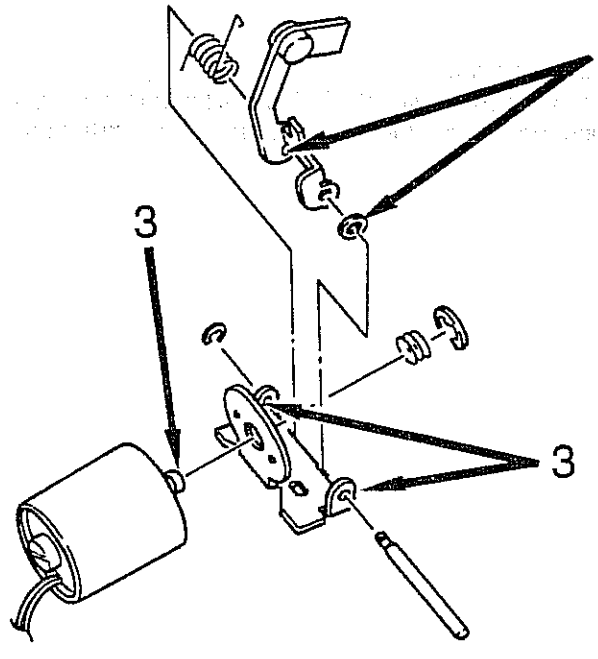
Chassis frame and platen



Carrier drive




Hammer solenoid



## 6.2 Cleaning

**Notes on cleaning:**

- Thinners or other cleaning liquids that contain organic solvents or chlorine-based compounds can damage the housing and metal components.

- Dropping pins or paper clips inside of the unit can short circuit electronic components and interfere with moving parts.

- In order to prevent the rusting of internal components and short-circuiting of electronic components, the inside of the typewriter should only be wiped with a clean, dry cloth.

- When cleaning the inside of the typewriter, always be sure to turn off the power first in order to prevent personal injury and damage to the mechanical and electronic components.

The following components should be removed for cleaning:

- Platen
  Remove the platen. Dampen a clean cloth with alcohol and wipe away dust and debris on the surface of the platen. After cleaning the platen, do not use the typewriter until the alcohol has evaporated.

- Printwheel
  Remove the printwheel from the carrier.
  Dampen a clean cloth with alcohol and wipe the spokes of the printwheel.
  After cleaning the printwheel, do not use the typewriter until the alcohol has evaporated.

- Keyboard
  Dampen a clean cloth with alcohol and wipe the keytops.
  If necessary, remove the keytops from the keyboard panel.
  After cleaning the keytops, do not use the typewriter until the alcohol has evaporated.

- Housing
  Remove the housing.
  Dampen a clean cloth with alcohol and ammonia and wipe the housing. After cleaning the housing, do not use the typewriter until the alcohol and ammonia have evaporated.

# 7. Tools

The following tools are required:

1) Radio pinchers
2) Phillips screwdrivers (large and small)
3) Flathead screwdrivers (large and small)
4) Wrenches (5.5mm, 6.0mm, 7.0mm)
5) Nut drivers (5.5mm, 6.0mm, 7.0mm)
6) Nippers
7) Soldering iron and solder
8) Spring hook
9) Jeweler's screwdrivers
10) Tester
11) Oscilloscope
12) Ruler
13) Calipers
14) Gap gauge
15) Tweezers
16) E-rings (2.0mm, 2.5mm, 3.0mm, 4.0mm, 6.0mm)
    (During re-assembly, new E-rings should be used, since they become loose after being removed two or three times.)

# 8. Troubleshooting

| Symptoms | Possible Cause | Solution | Ref. in Manual |
|---|---|---|---|
| **1. Power supply** | | | |
| Even though the power is on, the typewriter does not operate and the LED does not light. | • Either the power supply cord is not plugged in properly, or the connector (CN201) is not connected. | Plug in the cord or connect the connector. | 5.7, 9.1 |
| | • The ROM (IC203) is not installed. | Install the ROM. | 5.2, 9.6 |
| | • The power switch or transformer has failed. | Replace. | 5.7, 9.1 |
| | • The fuse (F201) is blown. | Replace. | 5.2, 9.1 |
| | • The control PCB has failed. | Replace. | 5.2, 9.6 |
| | • The LED or a connector (CN208, CN209) has failed. | Replace. | 5.2, 9.2 |
| **2. Initial operation** | | | |
| When the power is first turned on, the typewriter does not perform the initial operations. | • A connector (CN202 to CN210) is not connected. | Connect the connector. | 5.2, 9.5 |
| | • A motor has failed. | Replace. | 5.4, 5.6, 9.3 |
| | • The LCD cable is not connected. | Connect the connector. | 5.2, 9.5 |
| | • The LCD has failed. | Replace. | 5.2, 9.5 |
| | • IC201, IC202, IC203, or IC206 has failed. | Replace. | 5.2, 9.6 |
| | • The control PCB has failed. | Replace. | 5.2, 9.6 |
| **3. Beeper** | | | |
| The beeper does not sound. | • The beeper (BZ201) has failed. | Replace. | 5.2, 9.6 |
| | • IC201, IC202, IC203, or IC206 has failed. | Replace. | 5.2, 9.6 |
| | • The control PCB has failed. | Replace. | 5.2, 9.6 |
| **4. Carrier** | | | |
| The carrier does not move or is out of adjustment. | • The connector (CN204) is not connected. | Connect the connector. | 5.4, 9.3 |
| | • The carrier motor has failed. | Replace. | 5.4, 9.3 |
| | • IC201, IC202, IC203, or TRA201 has failed. | Replace. | 5.2, 9.6 |
| | • The control PCB has failed. | Replace. | 5.2, 9.6 |
| | • The carrier belt tension may be improperly adjusted. | Adjust the carrier belt tension. | 4.4.6, 5.4 |
| | • The belt tension/carrier motor spring has failed. | Re-assemble or replace. | 4.4.6, 5.4 |
| | • The adjustment screw may not be adjusted properly, or the left end switch has failed. | Adjust or replace. | 4.4.1, 5.6, 9.4 |

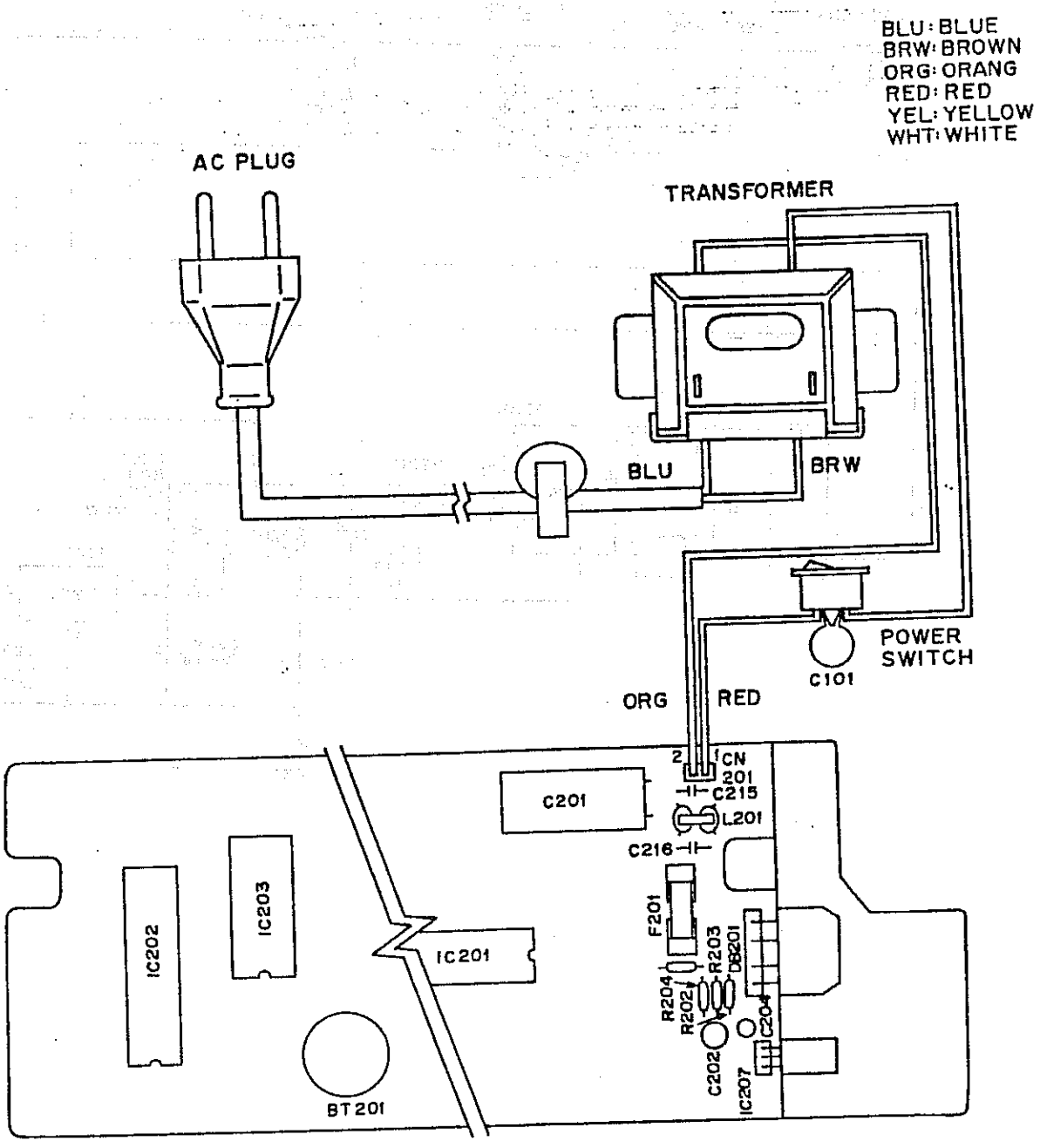
| Symptoms | Possible Cause | Solution | Ref. in Manual |
|---|---|---|---|
| **5. Platen** | | | |
| The platen does not feed paper forward, or does not feed it forward evenly. | • A connector (CN208 or CN209) is not connected. | Connect the connector. | 5.2, 9.6 |
| | • A connector (CN205) is not connected. | Connect the connector. | 5.4, 9.3 |
| | • The LF motor has failed. | Replace. | 5.4, 9.3 |
| | • IC201, IC202, IC203, or TRA202 has failed. | Replace. | 5.2, 9.6 |
| | • The control PCB has failed. | Replace. | 5.2, 9.6 |
| | • The LF motor spring has failed. | Re-assemble or replace. | 5.4 |
| | • A foreign object, such as a label or a paper clip is caught between the platen and the paper pan. | Remove the object. | 5.3 |
| **6. Printing** | | | |
| Printed characters do not appear at all on the paper. | • A connector (CN206, CN208, or CN209) is not connected. | Connect the connector. | 5.2, 9.6 |
| | • The hammer solenoid has failed. | Replace. | 5.6, 9.3 |
| | • The ribbon has been used up or has broken. | Replace. | Ref. to operating instructions |
| | • IC201, IC202, IC203, TR201, or TR203 has failed. | Replace. | 5.2, 9.6 |
| | • The control PCB has failed. | Replace. | 5.2, 9.6 |
| Some characters are not printed. | • The printwheel is not set properly, or is not installed. (The front plate is positioned incorrectly.) | Re-assemble, replace, or press the CODE+W key. | Ref. to operating instructions |
| | • Spokes on the printwheel are broken. | Replace. | Ref. to operating instructions |
| | • The membrane sheet has failed or is not installed. | Re-assemble. | 5.2, 9.2 |
| | • The contact spring has failed. | Replace. | 5.2 |
| The characters that are printed do not correspond to the keys that are pressed. | • The printwheel is not set properly, or is not installed. (The front plate is positioned incorrectly.) | Re-assemble, replace, or press the CODE+W key. | Ref. to operating instructions |
| | • The home position for the selection motor is not set correctly. | Adjust the setting. | 4.4.2, 5.6, 9.3 |
| | • The hammer position is incorrect. | Adjust the positions. | 4.4.3, 5.6, 9.4 |
| | • The wrong ROM (IC203), country setting, or printwheel is being used. | Re-assemble, adjust, or replace. | 5.2, 9.6 |
| The top and bottom halves of characters differ in intensity or are missing altogether. | • The base stopper, adjustment plate, or rail slide is positioned incorrectly. | Adjust the positions. | 4.4.4, 4.4.5, 5.5, 5.6 |
| | • The ribbon cassette is used up. | Replace. | Ref. to operating instructions |

| Symptoms | Possible Cause | Solution | Ref. in Manual |
|---|---|---|---|
| **7. Correction**<br>When making corrections, either the ribbon cassette base does not lift up or the correction is not made. | • A connector (CN203) is not connected. | Connect the connector. | 5.6, 9.3 |
| | • The correction tape is not installed. | Install the correction tape. | Ref. to operating instructions |
| | • Either the hammer position or the home position for the selection motor is incorrect. | Adjust the positions. | 4.4.2, 4.4.3, 5.6 |
| | • The correct cam, lift pin, or drive ratchet has failed. | Replace. | 4.4.5, 5.5 |
| | • The base stopper, adjustment plate, or rail slide is positioned incorrectly. | Adjust the positions. | 4.4.4, 4.4.5, 5.5, 5.6 |
| | • The ribbon motor has failed. | Replace. | 5.6, 9.3 |
| | • IC201, IC202, IC203, or TRA203 has failed. | Replace. | 5.2, 9.6 |
| | • The control PCB has failed. | Replace. | 5.2, 9.6 |
| **8. Ribbon**<br>The ribbon does not feed properly. | • The ribbon drive gear, drive ratchet, drive bevel gear, ribbon bevel gear, ribbon gear, or ribbon feed pole has failed. | Re-assemble or replace. | 5.5 |
| | • The rail slide is not positioned correctly. | Adjust the position. | 4.4.4, 5.5 |
| | • The base stopper is not positioned correctly. | Adjust the position. | 4.4.5, 5.5 |
| | • The ribbon packing has not been removed. | Remove the ribbon packing. | Ref. to operating instructions |
| | • The ribbon has been used up. | Replace. | Ref. to operating instructions |
| | • The ribbon cassette has failed. | Replace. | Ref. to operating instructions |
| | • A connector (CN203) is not connected. | Connect the connector. | 5.2, 9.3 |
| | • The ribbon motor has failed. | Replace. | 5.6, 9.3 |
| | • IC201, IC202, IC203, or TRA203 has failed. | Replace. | 5.2, 9.6 |
| | • The control PCB has failed. | Replace. | 5.2, 9.6 |
| **9. LCD**<br>The LCD does not display anything. | • A connector (CN208 to CN210) is not connected. | Connect the connector. | 5.2, 9.5, 9.6 |
| | • The LCD cable is not connected to the LCD. | Connect the LCD cable. | 5.2, 9.5 |
| | • The LCD cable has failed. | Replace. | 5.2, 9.5 |
| | • The LCD has failed. | Replace. | 5.1, 9.5 |
| | • One of IC201 to IC203, R228, or R229 has failed. | Replace. | 5.2, 9.6 |
| | • The control PCB has failed. | Replace. | 5.2, 9.6 |

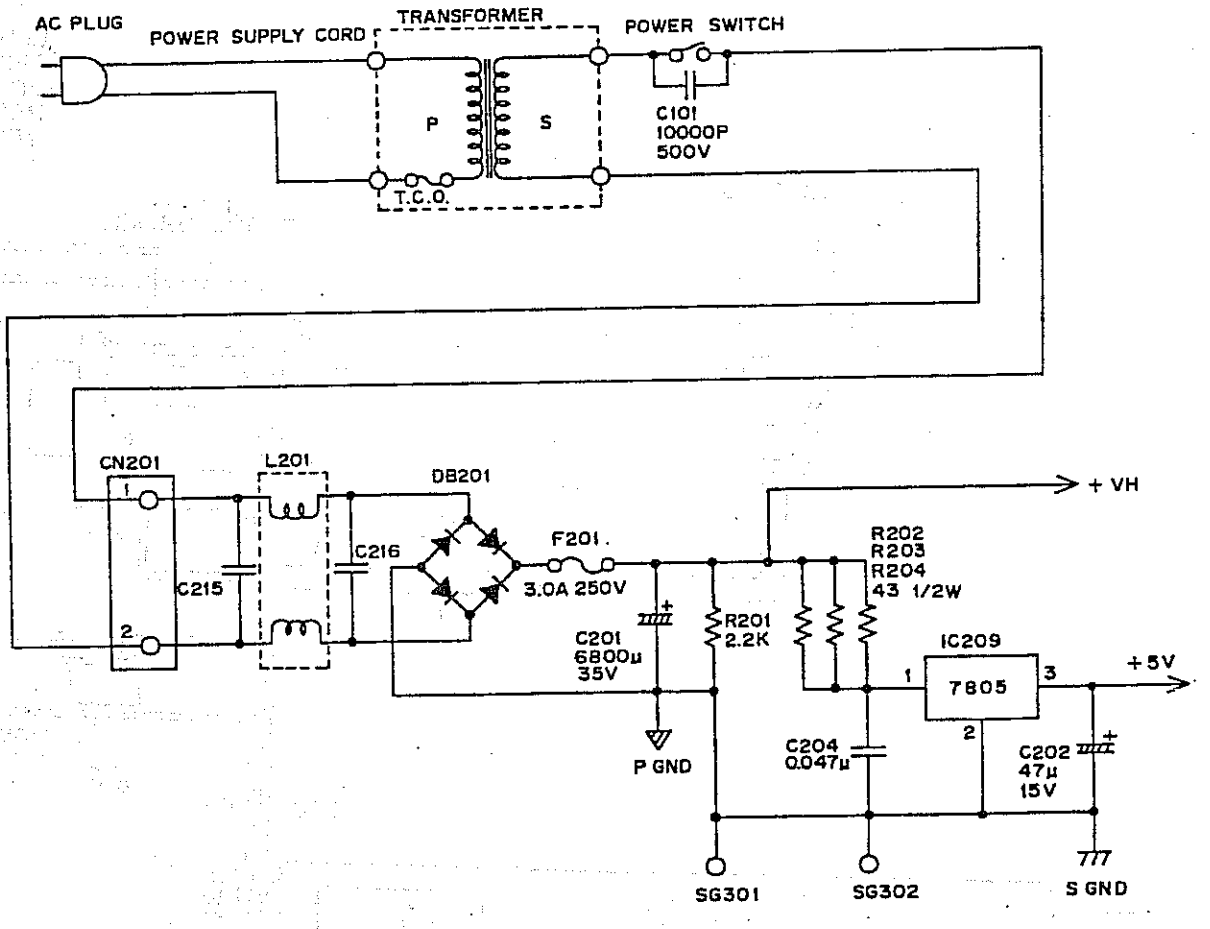
# 9. Circuit Diagrams and Layouts

## 9.1 Power Supply

### Power supply assembly layout

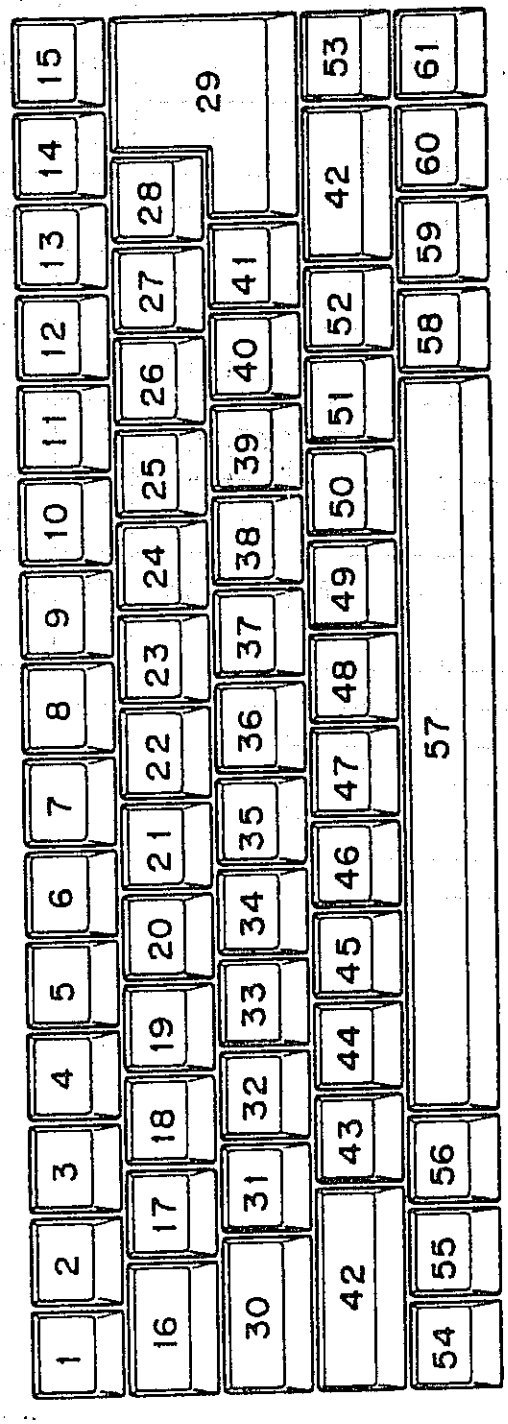


## Power supply assembly diagram

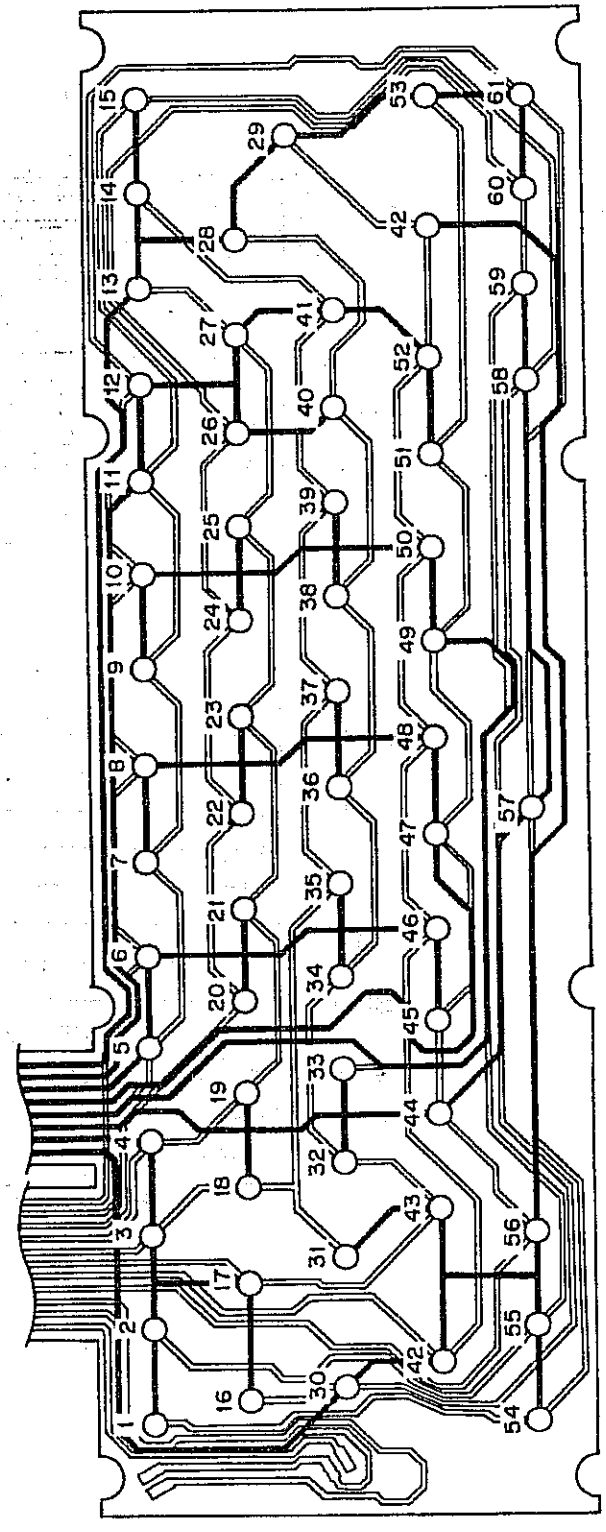


## 9.2 Keyboard

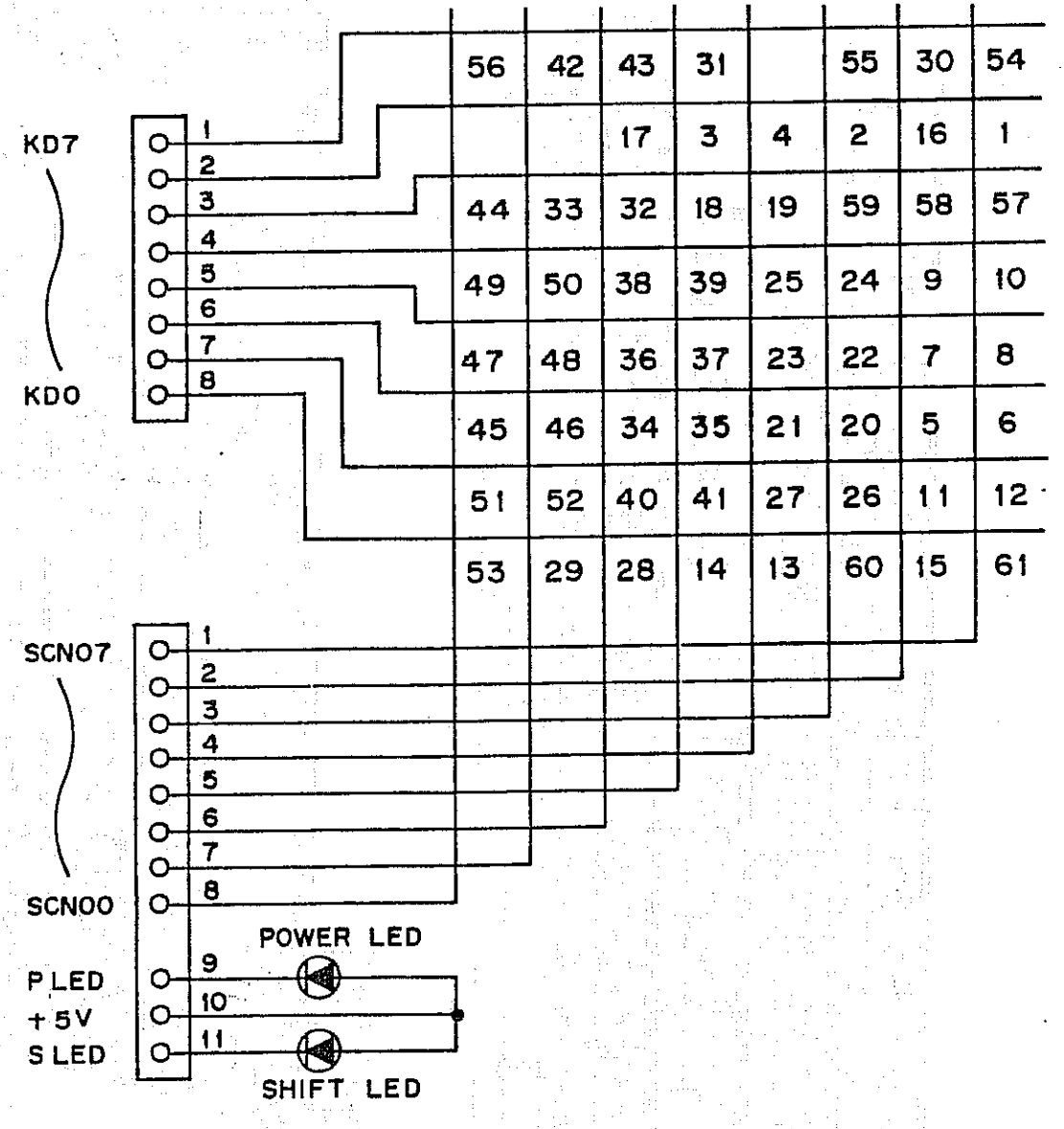
**Keyboard layout**




**Keyboard contact layout (membrane sheet)**

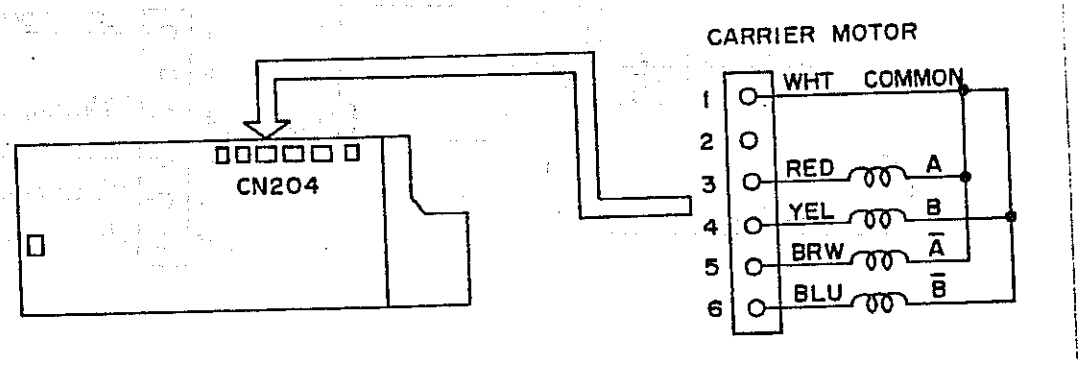


**Keyboard contact diagram (keyboard matrix)**

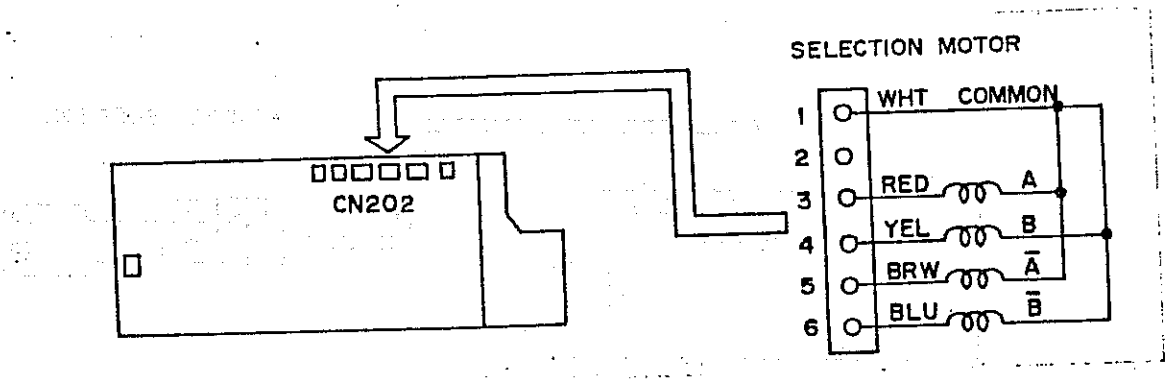


## 9.3 Motor Diagrams

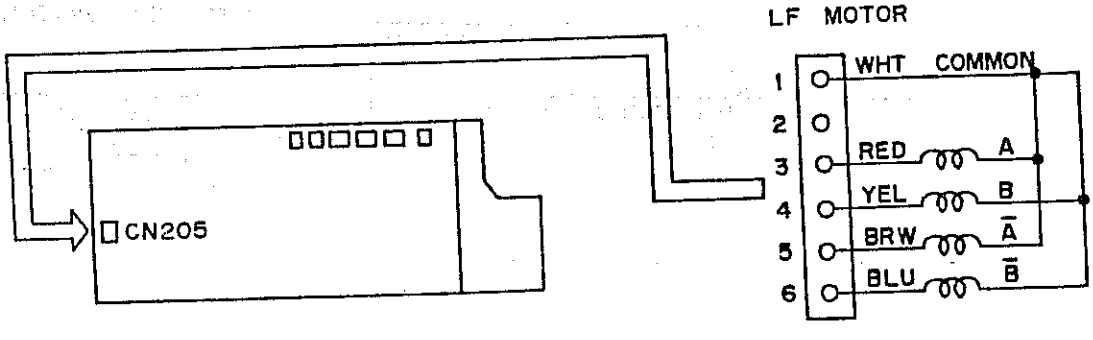
### Carrier motor



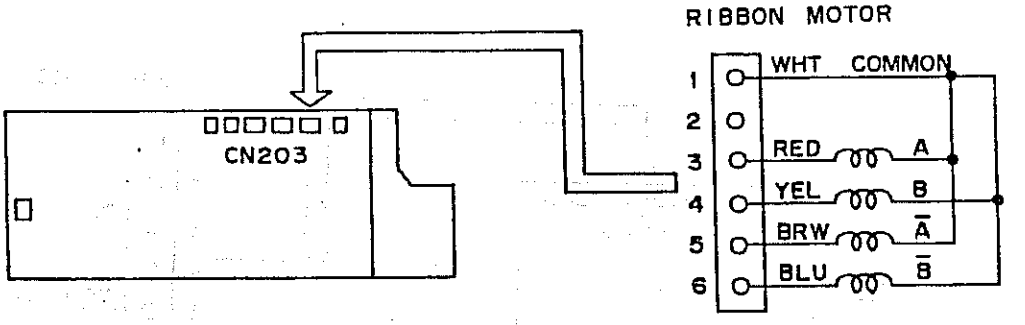

### Selection motor




### LF motor

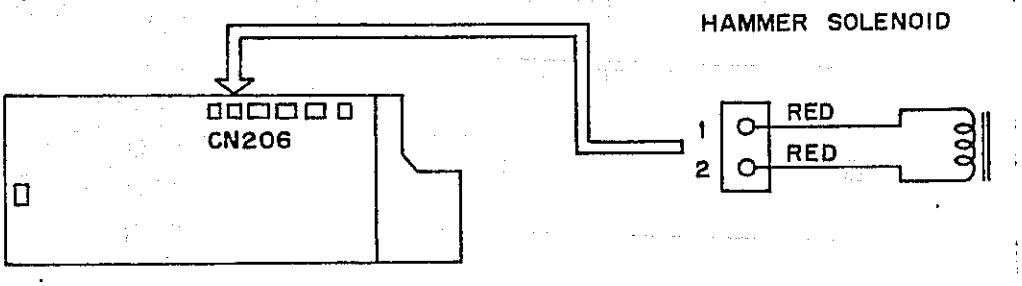


### Ribbon motor

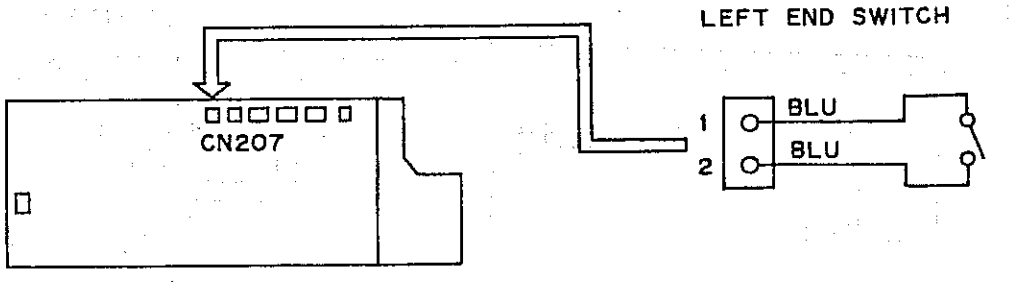



## 9.4 Solenoid and Switch Diagrams

### Hammer solenoid

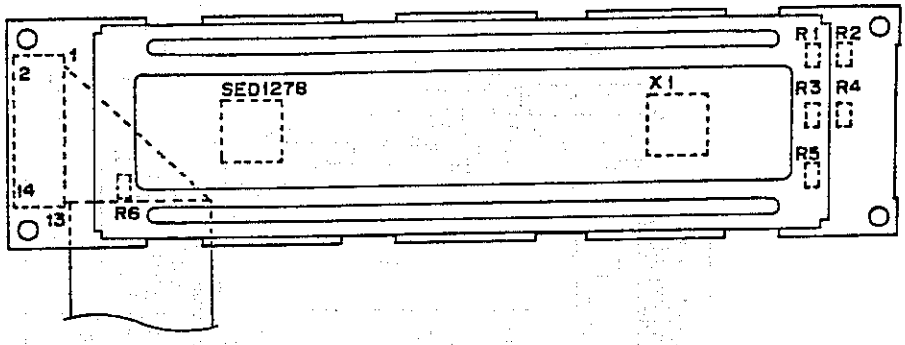



### Left end switch

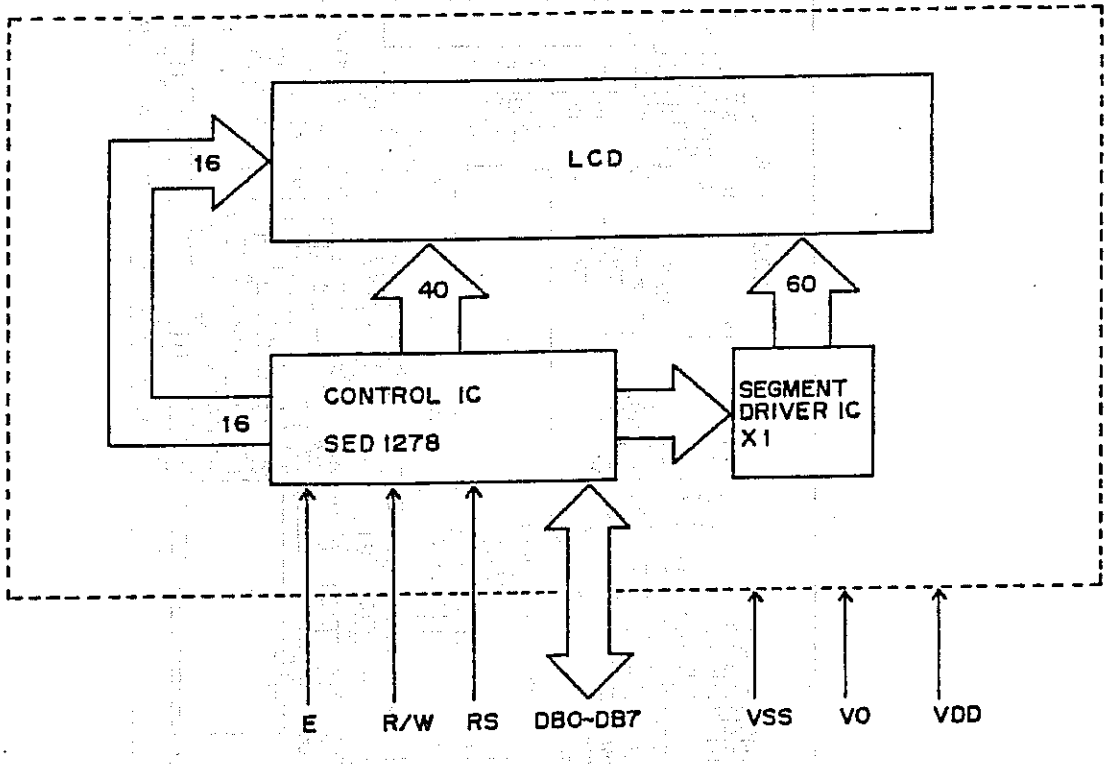


## 9.5 LCD

### LCD layout

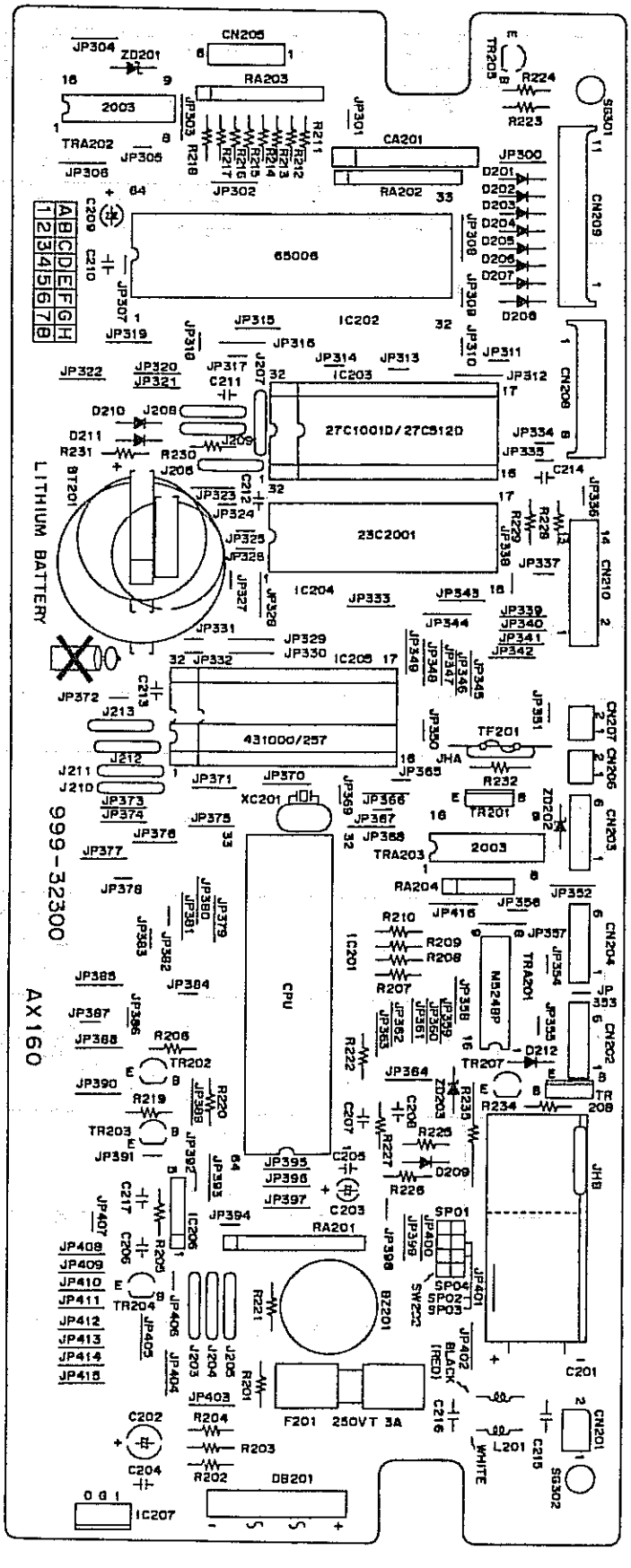



### LCD block diagram

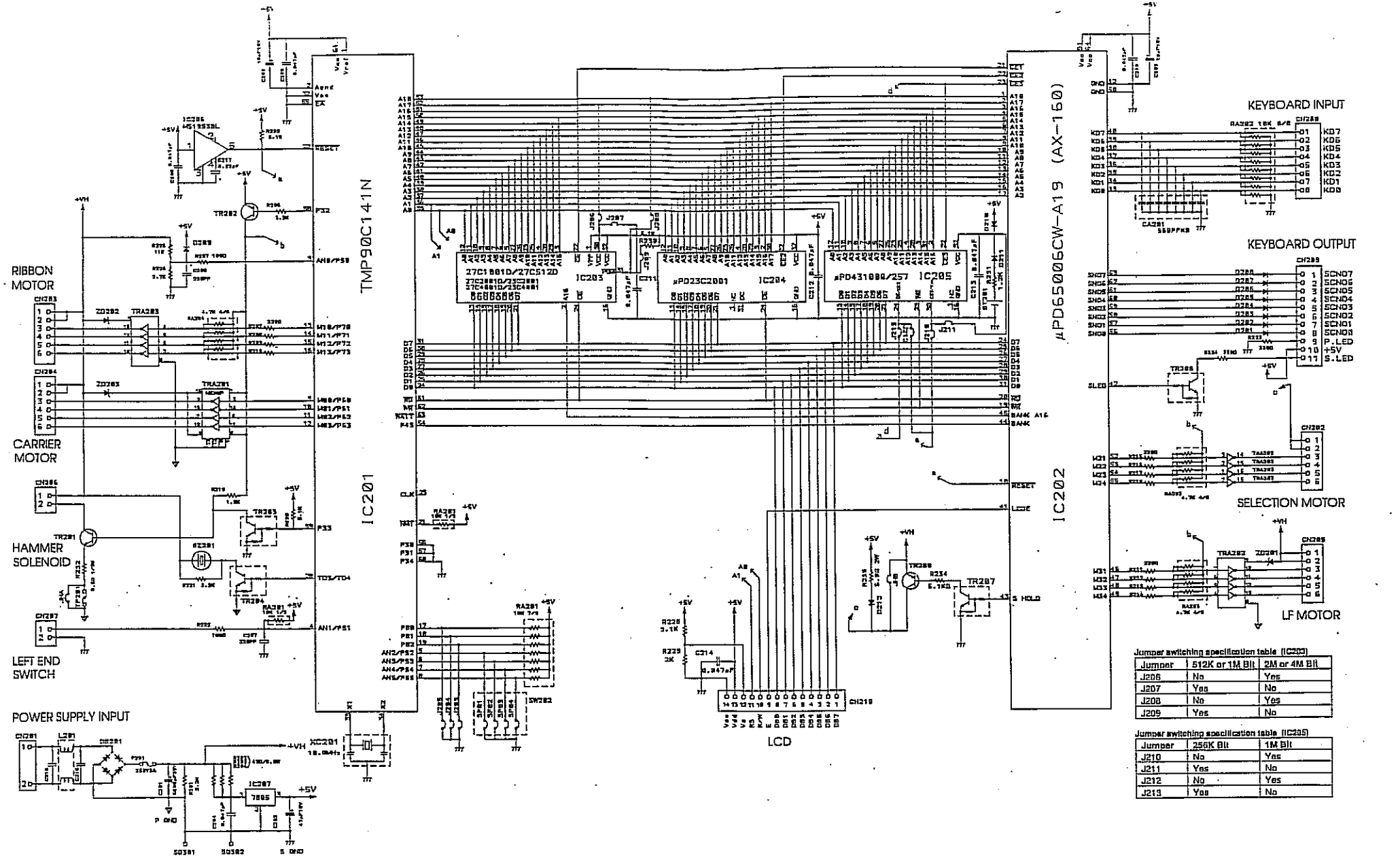


## 9.6 Control PCB

### Control PCB layout (Artwork No. 999-32300)



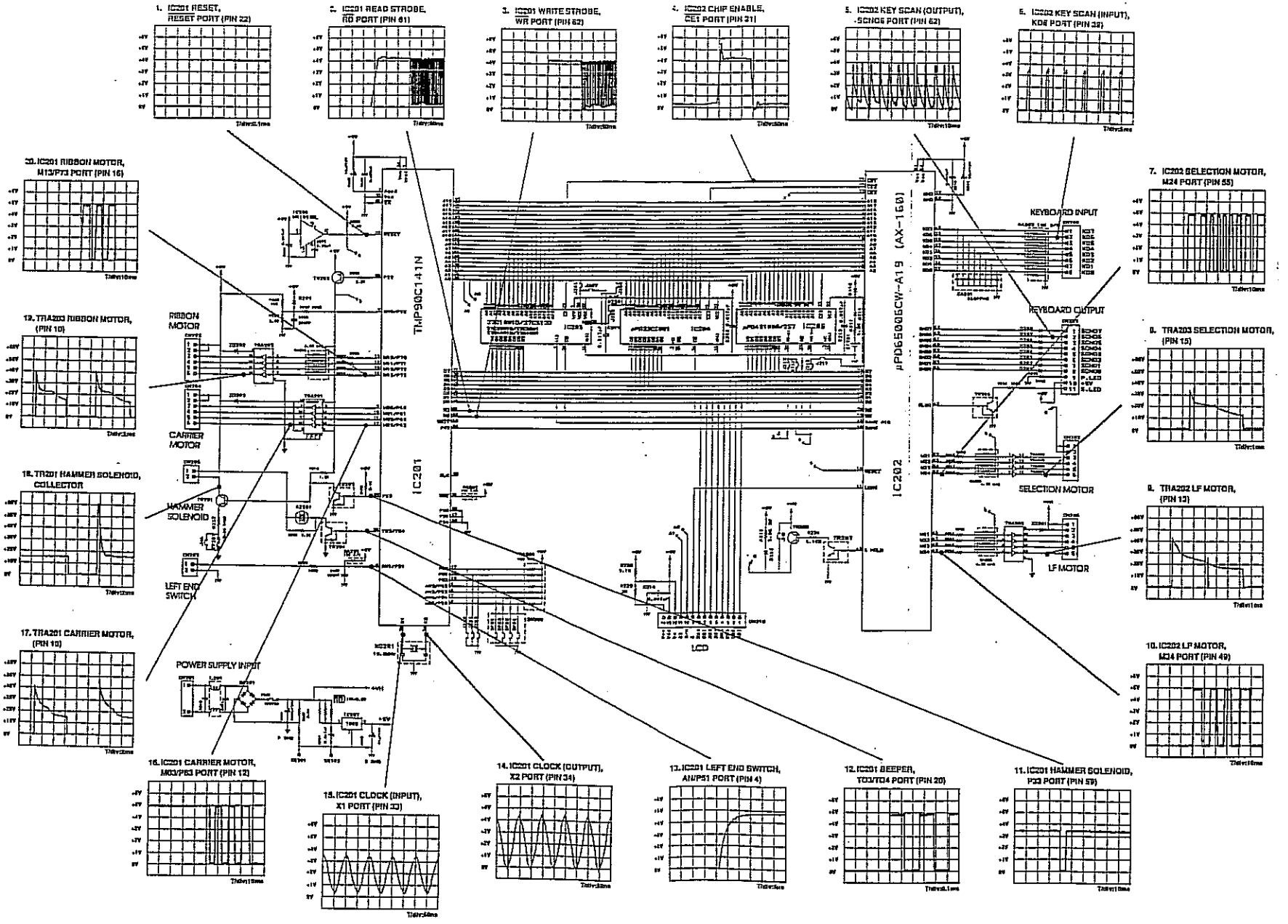
Control PCB diagram




Jumper switching specification table (IC203)

| Jumper | 512K or 1M Bit | 2M or 4M Bit |
|---|---|---|
| J206 | No | Yes |
| J207 | Yes | No |
| J208 | No | Yes |
| J209 | Yes | No |

Jumper switching specification table (IC205)

| Jumper | 256K Bit | 1M Bit |
|---|---|---|
| J210 | No | Yes |
| J211 | Yes | No |
| J212 | No | Yes |
| J213 | Yes | No |

Control PCB waveforms